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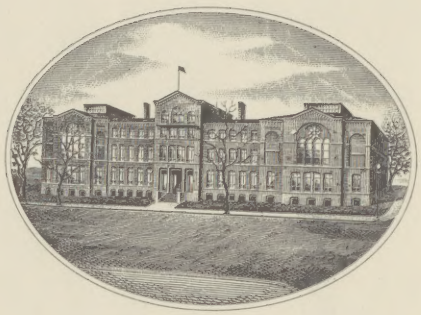

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REPORT ON SURVEY OF AIRCREW PERSONNEL IN THE EIGHTH, NINTH, TWELFTH, AND FIFTEENTH AIR FORCES

Psychological Branch
Research Division
Office of the Air Surgeon
Headquarters of the Army Air Forces

April, 1944

SECRET

REPORT ON SURVEY OF AIRCREW PERSONNEL

IN THE

EIGHTH, NINTH, TWELFTH, AND FIFTEENTH AIR FORCES

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Psychological Section

April, 1944

BY

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3 February 1944

Aircrew Selection and Classification Standards.

Name . . . . . Title . . . . . .

Standards indicated for . . . . . .

Assuming the individual has all the other characteristics necessary to do superior work of this type in combat operations, circle the number indicating the minimum acceptable standard which you believe should be required for each of the various traits listed below.

Exceptional	Very much better than average	Better than average	Average enlisted man	Worse than average
9 8	7	6 5	4 3	2 1

1. Judgement Ability to make sound judgements and choices as to the best thing to do when faced with a practical problem.	9	8	7	6	5	4	3	2	1
2. Mechanical Comprehension. Ability to understand and interpret the operation of mechanical devices.	9	8	7	6	5	4	3	2	1
3. Arithmetic Calculations. Speed and accuracy in adding, subtracting, multiplying, and dividing simple numbers.	9	8	7	6	5	4	3	2	1
4. Arithmetic Reasoning. Ability to solve quantitative problems expressed in verbal form.	9	8	7	6	5	4	3	2	1
5. Mathematics. Skill in the use of algebraic formula and other simple mathematical tools.	9	8	7	6	5	4	3	2	1
6. Reading Comprehension. Ability to understand and grasp the meaning of general and technical descriptions in written form.	9	8	7	6	5	4	3	2	1
7. Memory. Ability to remember specific and detailed information.	9	8	7	6	5	4	3	2	1
8. Dial and Table Reading. Speed and accuracy of obtaining specific information from dials and tables.	9	8	7	6	5	4	3	2	1

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9. Visualization of the Flight Course. Ability to visualize the course of the plane with reference to the horizon and fixed or moving reference points such as other planes. 9 8 7 6 5 4 3 2 1

10. Estimation of speed and distance. Ability to make estimates of speed, distance, and altitude in relation to the flight of the plane. 9 8 7 6 5 4 3 2 1

11. Orientation and Observation. Ability to find his correct geographic position by identifying the area below by comparison with maps and photographs. 9 8 7 6 5 4 3 2 1

12. Division of Attention. Ability to remain alert and observant of other things while the principal attention is directed to a specific activity. 9 8 7 6 5 4 3 2 1

13. Speed of Decision and Reaction. Ability to think quickly, to make rapid decisions, or to respond with speed and precision when the situation demands. 9 8 7 6 5 4 3 2 1

14. Serial Reaction Time. Ability to execute a series of simple movements rapidly and accurately. 9 8 7 6 5 4 3 2 1

15. Coordination. Skill in making appropriate movements with hands or feet to accomplish a specific task. 9 8 7 6 5 4 3 2 1

16. Finger Dexterity. Deftness in making fine adjustments or movements with the fingers. 9 8 7 6 5 4 3 2 1

17. Emotional Control. Ability to remain cool and collected and to think and act without interference from anxiety or emotion when faced with an emergency or a difficult situation. 9 8 7 6 5 4 3 2 1

18. Motivation. Interest in combat aviation and desire to fly and to be as effective as possible in doing the tasks assigned. 9 8 7 6 5 4 3 2 1

19. Dependability. Willingness to assume complete responsibility for carrying out all jobs assigned in an effective manner. 9 8 7 6 5 4 3 2 1

20. Leadership. Ability to inspire confidence, pride, and loyalty in men and to develop cooperation and a "team spirit". 9 8 7 6 5 4 3 2 1

ADDRESS REPLY TO:
COMMANDING GENERAL, ARMY AIR FORCES
WASHINGTON 25, D. C.

ATTENTION:

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON

29 March 1944

MEMORANDUM FOR THE AIR SURGEON:

Subject: Report on Survey of Aircrew Personnel in the Eighth, Ninth, Twelfth, and Fifteenth Air Forces

Nature and Scope of the Survey

During the period 22 November 1943 to 7 March 1944 the undersigned visited the Eighth, Ninth, Twelfth, and Fifteenth Air Forces. All of the heavy bombardment groups which had been operating for more than two months in the Eighth Air Force were included in the survey. Aircrew personnel in fighter groups, medium bombardment groups, and ferry squadrons were also studied in these Air Forces.

The survey was primarily concerned with the activities of aircrew personnel in units engaged in combat operations. The principal purpose was to discover the extent to which known individual differences in aptitudes and other traits are reflected in the combat effectiveness of aircrew personnel. In addition to certain necessary headquarters stations thirty-seven operating groups were visited. During the major part of this period the observer lived with the personnel in the groups and squadrons. Most of the time was spent with the squadron commanders, squadron operations officers, squadron navigators, squadron bombardiers, and the corresponding officers in the group. A large proportion of these officers had earned their advancement to these positions in combat operations and all of them were still active participants in actual combat operations over enemy territory. The information obtained from these officers, who are

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immediately responsible for current operations, was supplemented by observation and by discussion with the aircrew personnel under their supervision.

The following specific projects were included in this survey:

(1) A follow-up on one thousand six hundred and sixteen officers who had been classified for pilot, bombardier, and navigator duty on the basis of aptitude tests given in Air Forces Classification Centers before assignment to flying training schools. The squadron commander and squadron operations officer provided a brief description of the quality of the officers' work and also rated them on certain specific characteristics. The traits rated included (a) personal acceptability as an individual and an officer, (b) adjustment to combat activities including the tendency to be cool rather than nervous in combat flying, (c) eagerness to learn or improve in combat proficiency by developing skills or acquiring knowledge, (d) leadership ability in inspiring confidence, pride, and loyalty in men and developing cooperation and teamwork, (e) knowledge of technical duties and of the equipment used, (f) judgment in making necessary decisions and choices in combat activities, (g) skill in performing the duties of his combat assignment, and (h) general over-all effectiveness and desirability of individuals of his type in this sort of combat work.

(2) More than three hundred of the officers in immediate supervision of aircrew personnel indicated on a check list of twenty aptitudes, abilities, and other personal characteristics their judgments concerning the relative importance of each of these traits for an individual capable of doing superior work of a specific type in combat operations. These officers indicated the minimum acceptable standards which they believed should

be used for each of these traits in selecting and classifying aircrew personnel for duty as fighter pilots, bombardment pilots, navigators, bombardiers, radio-operator gunners, flight engineers, ball turret gunners, and waist and tail gunners. A copy of this check list is shown on the next page.

(3) The specific tasks performed by the personnel mentioned above and the skills and abilities necessary for obtaining good results were observed on various flights and operational missions, including a high-altitude group-formation training mission over England with the Ninety-first Bombardment Group (B-17), an operational mission from England to Ludwigshafen, Germany with the Hundredth Bombardment Group (B-17), a close support fragmentation bombing mission in Italy on materiel and troop concentrations back of the Northern enemy lines of the Nettuno beachhead with the Forty-seventh Bombardment Group (A-20), routine flights in B-25 and B-26 type planes, and a half-hour pickaback ride including simulated combat maneuvers in a P-38 with the Commanding Officer of the First Fighter Group.

(4) The mission folders for groups in the Eighth Air Force on each visual bombing mission in which the particular group participated during the period 1 September 1943 to 31 December 1943 were examined and the results analyzed. The analysis was primarily concerned with determining the reasons why the bombs fell where they did with respect to the aiming point. In establishing where the bombs fell the strike photographs in the group mission folders were supplemented by the bomb plots prepared by the Operational Research Section of Headquarters, Eighth Air Force. In assigning the principal factor responsible for poor bombing accuracy the narrative

reports of the lead bombardier and lead navigator were supplemented with informal discussions with the group and squadron officers. Similar studies were made of bombing accuracy for groups in the Ninth and Twelfth Air Forces.

Aircrew Personnel in Operations

As a basis for understanding the problems of combat personnel and evaluating the effectiveness of aircrew members in doing their assigned duties, a survey was made of the activities of aircrew personnel in combat operations. The purpose of this phase of the study was to extend the story of the selection of a potential Aviation Cadet by means of the medical examination for flying and the mental screening examination; his classification and assignment on the basis of preferences and aptitudes (stanine scores); on through various general and specialized training culminating in winning his wings; then through operational or replacement training units; and from there to a combat assignment with an overseas air force approximately eighteen months after he took the classification tests and was assigned to pilot, bombardier, or navigator training.

The general procedure followed in the European theater is to have replacement aircrew personnel assigned to a group at the reception center, then sent to a training center for approximately two weeks. At this center they are given training on British code and the special radio and navigational devices in use in this theater of operations. Gunnery training has also been provided for appropriate personnel. After the personnel are returned to the group they are expected to be on operational status within four days.

The policy concerning initiating new crews into operational work

varies considerably from one group to another and depends to a large extent on the ratio of crews to planes in the particular group. In some cases in the Eighth Air Force new crews spent several weeks in the group before they flew any missions. On the other hand, in the Mediterranean theater where the groups have been very short of personnel this winter, an instance was observed where a P-39 pilot with no time on multi-engine aircraft flew as copilot on a mission to Regensburg the next day after reporting to a B-17 group. The general attitude in the groups seemed to be that they had to train the personnel in their own special procedures, anyway, and when they are short of personnel they would prefer to get them immediately on arrival in the theater rather than wait for training within the theater. This was especially true when a shortage of planes in training centers required a long wait in that center to get in only a few hours of flying time. Present practice in most groups is to see that the first pilot and, to some extent, other personnel get in at least one or two missions with an experienced crew before taking the new crew into combat.

Because of the finding that attrition was higher on the first 5 or 10 missions, some groups had adopted the policy of having all new pilots fly as copilots with experienced personnel for about 10 missions. On the basis of their performance on these missions the best men were then checked out and given crews of their own regardless of whether they had come into the group as a first pilot or a copilot. As the other men developed they were also checked out so that all but the weakest pilots finished their tour as crew commanders.

This was regarded as a highly satisfactory procedure by the groups

using it and was reported to have cut down attrition since all crews had a crew commander with at least 10 missions experience. It was also believed to provide a satisfactory solution to the very bad morale problem found in some groups among copilots who were generally acknowledged to be better pilots and leaders than their first pilots, but because of having been started in the position of copilot had been continued there. In spite of the superior proficiency and potentialities of these copilots, a number of them completed their tour of duty and were returned to the Zone of the Interior without ever having an opportunity even to be checked out as first pilots on the airplanes they were flying.

The attitude towards going on the first mission is generally very good. Many months of training and preparation have preceded their arrival at this station and they are eager to get into action and become an experienced member of a combat group. The various changes in attitude which combat produces and the adjustment ultimately reached by these men will be discussed later under the topic of morale. Usually the member of a heavy bombardment crew goes to bed the night before his first mission knowing that the group is "alerted" for the next day and that he is likely to go, and hoping that the mission will not be "scrubbed" on account of bad weather. Most of the personnel report that they are too excited and "keyed up" to sleep well the night before.

Early the next morning, usually sometime between three and five o'clock in the morning, they are awakened and wash and shave, then have breakfast and report for briefing. At this time they are given their target, the plan of the mission, and the time they are expected to be at various check points. A fairly typical schedule includes briefing at

0500, taxiing at 0735, take-off at 0815, formation at 1002, target at 1138, coast on return at 1328, and return to base at 1430. Other information given includes altitude, which is typically between 21,000 and 28,000 feet on missions to Germany, speed, which varies around an indicated air speed of 160 miles per hour, the position in the formation, the planned fighter escort, type of bombs being carried, and specific bombing procedures to be used such as dropping on group or squadron leaders who are synchronized on the aiming point or dropping on signals of pathfinder aircraft. They are also given information about the weather, special signals to be used, and radio channels.

In England in the winter time it is usually still dark when the planes take off. It is also frequently necessary to climb through an overcast and form above it. Various devices are used to facilitate forming the group. The special navigational aids used in England are of particular value. Other procedures include a special plane painted in bright colors and on which many lights of all kinds are placed, colored flares, and having the tail gunner of each ship in the group flash a special colored light at intervals of about one minute for the plane which took off immediately behind them to see.

Difficulties encountered on take-off do not constitute one of the most critical problems in operations in heavy bombardment operations in these theaters. Forming under adverse weather conditions and before daylight has been critical and requires very close teamwork between the navigator and pilot. Failure to find the formation has resulted in an appreciable reduction in the size of the bombing force on several occasions. Forming and climbing to altitude take one to two hours so that it is some

time after take-off before the planes are ready to cross the enemy coast. Before crossing the enemy coast the guns are unslung and test fired. Test firing the guns in the close formations used has resulted in occasional accidents due to personnel error.

The personnel are alert and observant as they approach the enemy coast wondering what reception they will get in the way of flak and fighters. By this time friendly fighters are usually visible. Generally they are a considerable distance away and often are first noticed because of the vapor trails behind them. They seldom come close because experience has taught them that some gunners are nervous and "itchy-fingered." All the time they are over enemy territory the crew and especially the gunners keep scanning the sky for enemy fighters. They are especially attentive when near regions which briefing or experience has associated with anti-aircraft or fighter fields. The large formation is reassuring in itself, but the experienced personnel derive most satisfaction from the friendly fighters patrolling over or beside them.

The usual procedure is to fly to an initial point approximately fifteen miles from the target, then turn onto a new heading which should carry the group directly over the assigned aiming point. The typical bombing unit is a group of from 18 to 21 planes. The lead ship in the lead squadron is the group leader. Only the group lead and deputy group lead usually carried bombsights in operations in the Eighth Air Force during this period. On targets where little fighter opposition was anticipated in Northern France, Belgium, and Holland it was usual to bomb by squadrons of 6 planes.

The usual procedure was for the navigator of the lead ships to locate

the initial point, and the pilot would then turn the ship onto the new heading and set it on A.F.C.E. and turn it over to the lead bombardier. In practice the navigator in the B-17 usually assists the bombardier in identifying the target. The accurate location of both the initial point and the aiming point by the lead navigator and lead bombardier has been a source of considerable difficulty.

The lead bombardier takes such evasive action as is deemed necessary and desirable and then makes his final synchronization on the actual bombing run which is generally about one-half minute to two minutes in length. Wherever conditions permit a long bomb run is used sometimes as long as five minutes. More frequently, however, partial cloud cover, haze, or smoke screens necessitate a bomb run even shorter than 30 seconds.

In the ship leading the group in the Eighth Air Force a command pilot usually rides as copilot. It was reported that experienced men were sometimes very helpful in this position, especially by taking responsibility for major decisions based on their superior knowledge and judgment. However, senior officers lacking combat experience were stated to have caused a number of mission failures and sometimes serious losses. On the return from one mission to Germany a commander with little combat experience and a reputation for bull-headedness and disregard for the navigator or other crew members took his group far south of the briefed course into the vicinity of Paris. This group of planes flying alone and far removed from the fighter escort was immediately picked up by the enemy detection devices and fighters were sent up after them. One of the planes in the formation called the command pilot to report that he was off course but he was told, "Get off the air! I know what I'm doing!" This commander and,

various British radio procedures. The former are reported to be fairly good for certain types of landmarks such as seacoasts, lakes, large rivers, and cities. In the early work with blind bombing this past winter the devices used frequently failed to give satisfactory results at the critical time. For some time to come it seems likely that superior personnel will be essential if satisfactory operation of this equipment is to be achieved.

The actual bombing in medium bombardment groups is generally somewhat different than the type of operation just described. The medium bombers' targets are most generally described as the closer ones. Their specialty is not strategic bombing, but airfields, communications, and close support. Most of the study of medium bombardment by this observer was done in the Mediterranean where it was believed that a better opportunity was provided to observe the problems related to the special functions of medium groups.

It appeared that fundamentally the work was similar to that of the heavy bombardment groups so far as the personnel were concerned. However, some differences should be mentioned. The greater typical cruising speed (210 miles per hour indicated for the B-25's) and the shorter range reduce somewhat the likelihood of serious difficulties due to navigational errors. Since most bombing is done between 9,000 and 12,000 feet the work of the aircrew is not complicated by oxygen masks and protective clothing against extreme cold. Because of the need for more evasive action and a shorter bombing run and the use of PDI and, in some cases, the British Mark 9 bombsight, success is more dependent on close teamwork between the bombardier and pilot than in typical heavy bombardment operations. In much of the medium bombardment work results are more immediately obvious, especially in the case of communication lines including marshalling yards and bridges.

Because of the greater speed and shorter range, fighter escort is more effective. However, at these lower altitudes flak becomes a more serious problem. In close support work, when bombing concentrations of materiel or troops with fragmentation bombs, an area target is used rather than a specific aiming point, and the problem is to get a good pattern of bombs within the briefed area. The intervalometer is usually used to obtain the desired spacing between bombs in this type of work. In summary, although the operations are superficially quite different in a number of ways, the aircrew in general have very similar problems to those in heavy bombardment.

The general atmosphere in fighter groups is very different from that in heavy bombardment groups. This appears to be as much due to the differences in operational tasks and responsibilities as to differences in temperament of the aircrew personnel assigned. The task of the fighter pilot is ideal for high motivation. He has immediate knowledge of the effectiveness of his work. Although he has the satisfaction of working in cooperation with a number of fellow pilots, he also has considerable freedom of action, and can use his own judgment and make his own decisions with much less responsibility for other individuals than is possible for the heavy bombardment pilot.

The comparatively simple nature of fighter operations is reflected in the shorter, more informal, and less complicated briefings and interrogations. The fighter pilots take off and form much more rapidly than the bombers. When going on escort for heavy bombardment they are briefed to provide protection between specified points and at specified times. When flying as escort they are not usually selected as targets by the anti-aircraft gunners and they also can wait for the enemy fighters to commit

themselves before attacking. The fighter pilots are, as a general rule, eager for combat and they have, therefore, found patrol duty and sweeps over enemy occupied territory dull recently.

The recent development of procedures for carrying two 1,000 pound bombs on a P-47 greatly increases the potential striking power of such light bombardment operations. Dive bombing with such planes is reported to be very accurate, and should be of considerable value in both close support and against communications including shipping.

One of the chief concerns of the personnel planning and directing operational missions in the winter in England and also to a considerable extent in the Mediterranean is the prediction of weather conditions at the home bases at the time of the groups' return. They live in constant dread that the weather at all accessible fields might close down tightly some day while the planes are out and result in the loss of practically an entire air force. Usually landings on return from missions are routine and not a critical phase of the operations. However, there is occasionally an incident such as that reported from a heavy bomber field in England. Plane 504 had been cleared to land. In the bomb racks was one 500 pound bomb which had failed to release over the target. The pilot dropped the plane in, and as he started rolling down the runway the message came to him over the radio, "Tower to 504, tower to 504. There is a bomb following you down the runway." Fortunately, this story had a happy ending with the bomb coming safely to a stop and the pilot and his plane far over on the other side of the field. Some landing incidents have not ended so well.

Immediately after the landing the crews are interrogated by officers of the intelligence division. They report weather, enemy resistance

encountered, enemy tactics, and observed damage to enemy planes and targets. In many groups a critique is held at which the results based on the strike photos showing where the bombs hit, are discussed. Explanations are given of difficulties encountered and suggestions are made concerning procedures for future missions.

Bombing Accuracy and the Problem of Lead Crews

The crucial problem in air operations is getting the bombs on the assigned aiming point. Even superficial observation indicated that aircrew personnel are a very important factor in determining the success of such operations. The training of the personnel is very important, but even more important is the location and utilization of men with superior natural ability for key assignments. The experience of one group in the Mediterranean theater can be cited to illustrate this point. The bombing accuracy of this group and the morale were so bad that the group was taken off operations and the new group commander was given a month to get the group ready to go back on operations. The new commander immediately started an intensive training and evaluation program and reported his group ready to return to operations in less than a month.

Since they have been back on operations this group has consistently stood out as doing the most accurate bombing of any group in the wing, and the record of that wing is probably the best in the world. For the two months immediately preceding my visit this group had placed 58 percent of the bombs carried off within 200 yards of the assigned aiming point. The group bombardier and other officers who carefully trained and evaluated the bombardiers of this group reported that only about one in ten of the bombardiers assigned to the group were found to have the special aptitudes and

abilities necessary to become outstanding lead bombardiers. In this situation it is clearly of great importance to identify this exceptional 10 percent.

A typical statement on the selection of lead crews is quoted from the comments of one of the Group Commanders in the Eighth Air Force. He stated, "We pick what appear to be the most promising people on the basis of an interview. We then use trial and error in selecting people for lead crews. This method is very inefficient. One of the biggest mistakes being made is to send replacements with no one to tell the groups who is best. Information about their abilities and past performance should be sent with the men."

To obtain an accurate appraisal of the importance of lead crew personnel as a factor in bombardment operations, analyses were made of heavy bombardment operations in the groups of the Eighth Air Force during the period 1 September 1943 to 31 December 1943. Similar studies were made for groups of the Ninth and Twelfth Air Forces. The analysis for the Eighth Air Force includes records for all of the heavy bombardment groups that were operating at the beginning of this period. In the Ninth Air Force the records from 15 August 1943 to 15 January 1944 for the 387th Bombardment Group (Medium) provided the basis for the analysis. In the Twelfth Air Force the records of the groups in the 42nd Wing for the period 1 December 1943 to 31 January 1944 were used.

The bombing accuracy of the medium bombardment groups (B-26) in the Ninth and Twelfth Air Forces was higher than that of the heavy bombardment groups of the Eighth Air Force. The accuracy of the groups of the 42nd Wing was especially high. As noted above the type of bombing and amount of opposition is quite different for the groups under the various air forces.

The most important finding is not the differences in bombing accuracy of these groups, but the fact that the accuracy in all these groups can be substantially improved. The basis for this conclusion is shown in the table below which provides an analysis of the reasons why various groups and squadrons failed to achieve satisfactory results on particular bombing missions during this period. This analysis includes only missions on which bombs were actually dropped by the groups on enemy territory.

I. Analysis showing the percent of the unsatisfactory bombing missions of squadrons and groups which can be attributed to the various reasons indicated.

Reason	Percent		
	8th AF	9th AF	12th AF
1. Weather: Bombs not dropped at aiming point because of cloud cover	23	3	7
2. Smoke Screen: Bombs not dropped at aiming point because of smoke screen	5	0	2
Enemy Action: Bombing inaccurate because leadship hit on bomb-run, etc.	4	6	6
4. Command Decision: Bombing inaccurate because of change of plan by command pilot	4	0	1
5. Formation: Bombing inaccurate because of loose formation and stragglers	3	3	0
6. Collision Courses: Bombing inaccurate because of alteration in course necessary to avoid other groups on bombing run	3	3	5
7. Navigation: Bombs not dropped at aiming point because of failure to locate initial point, or bombing inaccurate because of different heading caused by overrunning initial point	16	0	2
8. Target Identification: Bombing inaccurate because aiming point not located or identified too late	20	34	21
9. Bombsight Technique: Bombing inaccurate because of inferior technical skill or gross errors in using the bombsight	11	46	33
10. Emotional Control: Bombing inaccurate because of nervousness and anxiety interfering with effective action on the bombing run	7	3	5
11. Bombing Equipment: Bombing inaccurate because of equipment failure on bombsight or bomb release mechanism on bombing run	4	0	18
12. All reasons for failure:	100	100	100

Since only unsatisfactory missions were included, the above table does not necessarily indicate that a particular difficulty was more frequently encountered in one air force than in another, but merely that the unsatisfactory results in one air force could be attributed in a larger proportion of the missions to this reason than they could in another air force. For example, weather, smoke screens, command decisions, and navigation difficulties account for a larger proportion of the failures in the Eighth Air Force than in the Ninth or Twelfth.

The operations of the Eighth Air Force being generally longer range and over Germany where the weather is frequently bad have been hampered more by this factor than those of the other air forces. Furthermore, if the groups of the Ninth Air Force find the target completely obscured by ten-tenths clouds, they are much more likely to bring the bombs back to their bases. These returned bombs are not included in the analysis of unsatisfactory bombing. On the other hand, the heavy bombers operating over Germany are directed to try various alternates if the primary target is obscured and, if none of these is visible, pick most any target of opportunity which presents itself within the borders of Germany. Smoke screens have been more extensively used to protect some of the vital targets in Germany than elsewhere and, therefore, appear more frequently as a difficulty for the Eighth Air Force groups.

In the Ninth and Twelfth Air Forces the commanders leading the group or wing are usually officers flying as first pilots who have had a substantial amount of combat experience. One story of an unfortunate mistake made by a relatively inexperienced Command Pilot in the Eighth Air Force was told in a previous section. There are a number of others. The longer

missions, poorer weather, and slower planes used by the Eighth Air Force as compared with the other two combine to make navigation a larger factor in their operations.

The reports of the Twelfth Air Force indicate a larger percent of difficulties due to bombing equipment failures than either of the other air forces. All of these air forces seem to have an occasional lead plane hit on the bomb run. In practice it is very difficult to shift the lead responsibility to the deputy lead minutes or seconds before time for the bombs to be released, especially if the lead plane is hit and is either knocked out of the formation or has to leave because of loss of engines or controls. The radio may be damaged and opposition is likely to be intense. In such a case other planes may start to follow the lead plane when it leaves the formation, resulting in general confusion in the formation.

Lack of adequate air discipline is chiefly responsible for straggling formations and collision courses. In some cases these may be due to errors attributable to lack of skill or ability. However, the more typical case is illustrated by a particularly confused and ineffective mission over a much bombed at but seldom hit city in Germany. On this mission one wing, instead of following the briefed course to the I. P. and from there over the aiming point, cut off the course and headed directly for the target when about thirty miles from the I. P. This short-cut put them on a collision course with other groups which had followed the briefed course and these other groups circled wide to avoid them. In the resulting confusion most of the groups dropped their bombs a couple of miles from the city on farms and fields over which the enemy smoke screen had blown, although the city itself was open and the visibility quite good.

The major point which stands out in the analyses for all three air forces is the large proportion of the errors which can be directly attributed to the inability of the lead bombardier and the lead navigator to do the job assigned to them. The four items - navigation, target identification, bombsight technique, and emotional control, all deficiencies of lead crew personnel - account for 54 percent of the unsatisfactory results in the Eighth Air Force. The proportion is slightly greater, 61 percent, in the Twelfth Air Force. In the Ninth Air Force practically all unsatisfactory bombing is due to these four reasons, the corresponding figure being 85 percent.

The difficulties tabulated under navigation can be illustrated by two examples. The first story concerns a mission to Norway. The distance was unusually great, mostly over water, and the territory to be bombed was unfamiliar to the personnel of the aircrews. To complicate matters there was an unusually thick overcast over the bases in England at the time of take-off. On arriving at the coast of Norway scattered clouds and snow made pilotage difficult. These conditions made the problem of navigation an unusually difficult one. In spite of this most lead navigators solved the necessary navigation problems and hit the coast at approximately the briefed point and went in and found the area in which bombing was to be done. Some of them got lost but kept cool and showed good judgment by going back out to the coast, reorienting themselves by pin-pointing on the coast line and calculating the proper heading to get them to the target area. Unfortunately, there were two or three lead navigators whose calculations were sufficiently in error to bring them into the coast at the wrong place, and whose aptitude for orientation by pin-pointing was not high enough to find

out where they were until so much fuel had been used that the groups were forced to return to their base without even having gotten to the target area.

Another example will illustrate what is probably the most frequent navigational difficulty, failure of the navigator to pin-point himself accurately at the I. P. On this mission the group had been briefed to bomb a factory in Paris. The briefed change in heading at the I. P. was unusually small, only about twenty degrees. The navigator was unable to locate the I. P. and finally discovered where he was after he was several miles past it. By rapid and accurate calculations he gave the pilot the proper heading to carry the group over the target, but by that time they were so close to the target that they had only a short run to the release point. The run was so short that although the bombardier was able to identify the target and make a run on it using his bombsight, he did not get the settings which had been previously calculated and preset for the briefed heading changed. Since his heading was approximately ninety degrees off that briefed, his bombs hit two or three thousand feet away from the target and were not effective. This navigator was a graduate of an engineering college and had high mathematical aptitude, but his aptitude for orienting himself and identifying landmarks and areas from a study of them on a map was known to be low.

A source of bombing inaccuracy very closely related to navigation is target identification. This is fundamentally a bombardier problem. However, aptitude for quick and accurate observation and orientation has been emphasized to a greater extent in selecting navigators than bombardiers because this aptitude was found to be important for work in navigation

training, but not related to success in bombardier schools under existing instructional procedures because target identification is not a problem on the bombing ranges. Therefore, the bombardiers usually had to get assistance from the navigators in locating the targets. This is not a very satisfactory situation since the bombardier has to get the target in his sight to do his job, and communication is difficult when wearing oxygen masks. Navigators report that some lead bombardiers have difficulty seeing the target even when its location is carefully pointed out to them. On the other hand, a few superior lead bombardiers with high aptitude for identifying areas from maps and photographs were found who were much better than their navigators at identifying the briefed aiming point.

A fairly typical example of failure due to errors in target identification is afforded by a Ninth Air Force report. This particular unit was briefed to bomb a specific patch of woods. No difficulty was encountered in getting to the I. P. and the turn was made onto the briefed heading. Unfortunately, there seemed to be a number of patches of woods. The lead bombardier with the help of the lead navigator picked out a patch which appeared to be the right size and shape, and the group placed a very good pattern of bombs in it. The group was very pleased with the job they had done until the intelligence division told them that after a careful search they had finally identified the patch of woods shown in the strike photographs and it was six miles from the assigned patch and, as far as they knew, quite devoid of any military interest.

It seems strange that with bombing accuracy far below that achieved by even the worst graduates in bombardier schools, bombsight technique should be reported as an important cause of bombing inaccuracy. It is probably true that all of the failures tabulated under this heading could

be traced back to some other contributing factor. Bombsight technique appears as important as it does because of two reasons - short runs and distractions. Short bombing runs may be caused by such contributing factors as partial cloud cover, smoke screens, faulty navigation, late target identification, strong enemy opposition, or various types of mechanical failures. Distractions include specific things like flak and fighters, and more general conditions such as cold, the use of oxygen, and the general emotional stimulation associated with combat operations. Given enough time, anyone can synchronize a bombsight, but it takes a great deal of aptitude for estimating rates to make the small number of quick, accurate, and decisive corrections necessary for a successful short bombing run. Similarly, although most men can be trained to follow a systematic bombing procedure and do each task in its proper sequence on a practice bombing mission, it takes an exceptionally systematic and thorough individual to give the proper attention to each step when confronted with the many distractions of the combat situation.

Even the best of the bombardiers now leading groups in these air forces were found to make occasional errors of this type. The group bombardier with the best record of any of those examined in the Eighth Air Force failed to get his bombs on or close to the assigned aiming point on only one occasion, and this was definitely attributable to bombsight technique. On this mission they were bombing an aircraft factory in Paris. He identified the target with the aid of check points although the haze made it somewhat difficult. He made his usual few, accurate, clean-cut corrections. As the plane came over the release-point which he had previously calculated in terms of landmarks around the target, he suddenly discovered that he had forgotten the trigger. He made a quick decision and,

since he was a little past the release point, decided not to toggle them out where they would be likely to fall beyond the assigned target, but instead led the group directly to the secondary target and placed their bombs right in the middle of it. If more bombardiers like this one were placed in the lead planes, it would not be necessary to make so many return trips to the same target areas.

The remaining personnel factor which is probably responsible or partially responsible for quite a few more failures than shown by the tabulations is emotional control. Pilots who get excited and take such violent evasive action that they tumble the gyro or turn off the bomb run too soon, navigators who accidentally hit the toggle switch in their nervous efforts either to locate or look at the target, and bombardiers who get so excited they forget to open the bomb-bay doors, to change from extended vision, to warm up the sight, or turn the switches on, all contribute to failures of this type. However, probably the bombardier, because of the nature of his job, is found contributing to this category most frequently. The narrative report of one lead bombardier who after leading a few missions was replaced as a lead bombardier because of continued nervousness on the bomb run, is quoted below. The punctuation and grammar have not been changed.

"1. The aircraft was put on A-5 at the IP, prior to that time about one minute before arrival the Colonel decided that we should go in at 21000 instead of 22000 as originally planned. I quickly recomputed my trail and ATF. By the time we arrived at the IP my altimeter showed that we had not reached 21,000 . . . I took out 8 mils of trail, leaving 50 mils . . . I also took out 1 second of ATF.

2. At the time I took control of the aircraft I could not see the target either through the bombsight or out of the glass under the turret, I let the a/c stay on the same course it was on at the IP. The visibility was limited from where I was and also poor

due to haze. . . . When I saw the coast I found we were coming in at right angles. It should have been quite an acute angle.

3. The coast line was familiar, however, and I recognized a spit, and as the gyro in my bombsight did not appear to be erect. I caged and uncaged it, my mind thus being distracted from it. When the target appeared in the sight, it was slightly to the left. I made two drift corrections to get onto the target area, and it remained there. I kept waiting for the warning flag to come down and it never did. I looked out of the bombsight and the target area was almost right under us, and there was no indication that the range mechanism in the sight was operating, as the sighting angle sweep-knob did not appear to be moving. In view of that I dropped the bombs with the toggle switch. Due to the limited visibility from the nose, I could not see where the bombs hit, but others in my ship say that the bombs hit short by about 2 miles. We turned left and came out.

4. There was no maneuvers at the IP. As there was very little flak interference, bomb doors were opened at the IP. Enemy resistance was practically nil, and had no effect on the bomb run. The weather was clear, except for haze around the target. There was no unusual tactics on the bomb run."

Unfortunately, the report from the crew members was verified by the strike photos and the bombs of this group were found to be approximately two and one-half miles short and apparently did little damage. The group bombardier reported that this bombardier has not been allowed to lead the group since this incident. Later examination revealed that the equipment was working perfectly, but the pressure of the situation confused him to such an extent that he lost confidence in his own work and also in his bombsight.

Another illustration of nervousness interfering with effective action on the bomb run is illustrated by an incident from a B-24 group in the Eighth Air Force. In the course of obtaining ratings of how well the various officers in the group followed up were getting along, the following comments were obtained about a navigator who had been in the squadron a bout two months and had been on eight operational missions. "He is eager and

very conscientious and wants to do everything right. He is nervous. This is not due to the stress of combat but he is just naturally a nervous type. Rank impresses him. When the Colonel pinned the Air Medal on him for participating in five missions it was noticed that his knees were shaking. This nervousness does not effect his work in combat."

The following day in conversation with the group bombardier of this same B-24 group various personnel errors were being discussed. In the course of this discussion he reported this incident. "On the mission to an enemy air field near Bordeaux yesterday we had an unusually long bomb run. There was no enemy opposition and we could identify the target area from way out at sea. We started the bomb run as soon as we could identify the target and because we were bucking a strong head wind we seemed to be just creeping along. The bomb run was about fifteen minutes long. We came very close to losing all of our bombs when we were still ten miles from the release point. We had been on the bomb run about ten minutes and it began to seem as though we never would get rid of the bombs. Suddenly the bombs of one plane were seen to drop. Although they were not from our lead plane the suggestion is very strong when you want to get rid of them anyway and the rest of our bombardiers did unusually well to hold them because the head wind made it appear that we should be fairly close to the release point. Later questioning revealed that one of the pilots had said over the interphone, 'Let me know when bombs are away.' The navigator on this ship heard only 'bombs away' and thinking that the pilot had seen other bombs dropping salvoed the bombs from his plane."

Further questioning indicated that this was the same navigator whose knees knocked together when the Colonel gave him the Air Medal. Fortunately,

in this case the bombs of the group, less those of this one plane, were released on the correct signal and obliterated the assigned target. However, there have been a number of occasions when with greater enemy opposition and poorer visibility such an incident has resulted in a waste of all bombs except those in the lead plane.

It should be noted that these "nervous" men are not cowards, but are eager to do their part and will continue to fly. It is to be hoped, however, that their flying will not be done in lead planes.

These studies have clearly shown that although all of these officers have been through a similar training course and have demonstrated a certain proficiency for this type of work, enormous individual differences due to natural aptitudes, temperament, and backgrounds persist and are one of the primary factors in determining the effectiveness of bombing operations. Information concerning these differences in individuals should be systematically made available to group and squadron commanders so that it can be utilized in the formation of lead crews and in making other combat assignments.

Selection of Fighter Pilots

In discussing the effectiveness of various pilots in their present combat assignments with the Squadron Commander and the Squadron Operations Officer, these officers frequently stated that the pilot under discussion was doing a fairly adequate job, but was not as effective as he should be because of lack of interest. It was usually added that this pilot was much better suited for some other type aircraft, that he had always been interested in this other type and had expressed a preference for it in training, but for some reason had not been given the assignment he wanted. Time after

time pilots stated, "The men in my class who wanted to be pursuit pilots got four-engine assignments and the men who wanted four-engine got pursuit." Although this is certainly a gross exaggeration, it is indicative of the lack of confidence of these pilots in the older classification procedures. This malassignment was found to be decreasing the efficiency of the air force groups by a substantial amount.

The assignment of pilots to a particular type of advanced training has been based on instructors' recommendations, students' preferences, quota requirements and certain considerations with respect to height and weight. The pilots in the air forces visited felt very strongly that this procedure needed improvement. A similar conclusion was reached by a study reported by Psychological Research Unit No. 3 in the AAF Training Command and dated 3 February 1944. This study stated, "In general, little or no agreement was found among instructors regarding the characteristics by which a good fighter pilot could be distinguished from a good bomber pilot. In practice, (instructor's) recommendations for assignment to advanced training seemed to depend primarily upon the preference stated by the cadet. To some extent the cadet's choice is influenced by discussion with his instructor. According to instructors' reports, preferences are determined by relatively unimportant considerations and are quite unstable." In many cases actual assignment did not follow either the cadet's preference or the instructor's recommendation, but was primarily based on the week's quota requirements in that training area.

Certain preliminary studies made by Psychological Research Unit No. 1 and by the Psychological Section, Headquarters, AAF Training Command indicated that the classification tests used to qualify men for bombardier,

navigator, and pilot training could also be used to obtain differential aptitude scores (stanines) for pursuit and four-engine assignments. One study showed that percent hits in fixed gunnery training against towed targets was significantly related to certain of the aptitude test scores obtained by the pilots in classification testing. Another study indicated that success in two and four-engine transition training was associated with a somewhat different group of these aptitude test scores.

In the present survey approximately three hundred fighter pilots who had taken the various classification tests at one of the three AAF Classification Centers before being sent into preflight training were followed up. These pilots were typically about half-way through their combat tour and their superior officers had had a good opportunity to observe them on operational flights. Thus far it has been possible to make only a preliminary analysis of the results based on a couple of the groups. The complete analysis will be reported later. This preliminary analysis indicates that the combination of aptitudes, abilities, and interests which is represented by the pilot stanine and which has been found to be quite accurate in the prediction of success in flying training also predicts success in combat. In the first groups examined there were no pilots at all with stanines of 1, 2, or 3. There had been one officer with a pilot stanine of 3 but he was missing in action. The officers with pilot stanines of 4, 5, and 6 had quite frequently been found to be of doubtful value to the combat group, and a relatively larger proportion of them were reported missing in action as compared with the officers having relatively high pilot stanines of 7, 8, and 9.

The Squadron Commander and his Operations Officer gave a brief description

of each of the individuals being followed up and then rated him with respect to certain aspects of his adjustment and effectiveness. The typical comments reported for the 4, 5, and 6 stanine pilots were, (1) "Tries hard but is very slow," (2) "Goes to pieces as far as judgment is concerned if things aren't just as planned on the ground," (3) "Flapped the wings of his P-38 at people in France waving at him when he was coming back on the deck on one engine and with one boom burned almost in two," (4) "Lacked knowledge of plane and judgment in flying it," (5) "Very rough and jerky and overcontrolled when trying to fly formation," and (6) "Instead of anticipating he waits to see what happens. Then says it's bad luck." The comments for pilots with stanines of 7, 8, and 9 were typically as follows, (1) "A very good man. The best type we have. Works hard. Knows his plane well. Conscientious and intelligent. Has good judgment and covers wing without being told." (2) "Good head. Steadiness in formation good," (3) "Would like to have a lot like him. Good in everything," and (4) "Steady and cool. Very good judgment in combat. Likes it."

To obtain the direct judgment of the people in the best position to know what aptitudes and traits are essential for becoming an exceptional fighter pilot, a check list for indicating minimum acceptable standards was used. A copy of this form was shown in connection with the outline of the general plan of this survey. The scale used was a nine-point scale which was described to the rating officers as follows. The mid-point of the scale, 5, represents the aptitude or ability on the particular trait which the average potential Aviation Cadet shows when he takes a test of this type in the AAF Classification Center. The value of 4 is a little below the average of the candidates for Aviation Cadet training in the AAF

Classification Centers, but a little higher than the average enlisted man who would be at about 3 on the scale. The points 1 and 2 are below this average enlisted man level. The average of the people getting through training and assigned to duty in a combat theater is about 6. A value of 7 is a little above the average of these men and 8 is very much better than the average of these officers. The top point on the scale, 9, is used to designate exceptional aptitude or ability with respect to a particular trait.

Thirty Squadron Commanders and Squadron Operations Officers in the Eighth, Twelfth, and Fifteenth Air Forces who had been in active combat operations for some time independently indicated the minimum standards desirable for fighter pilots. These are given in the order of importance attached to them by these officers in the table below. (For the complete definitions of these traits as they appeared on the check list, see the check list following page 3 of this report.)

Minimum Acceptable Standards for Fighter Pilots

1. Speed of Decision and Reaction	8.0	11. Memory	6.6
2. Judgment	7.7	12. Coordination	6.1
3. Motivation	7.7	13. Mechanical Comprehension	6.0
4. Emotional Control	7.6	14. Serial Reaction Time	5.9
5. Estimation of Speed and Distance	7.5	15. Reading Comprehension	5.6
6. Division of Attention	7.5	16. Arithmetic Reasoning	4.8
7. Leadership	7.4	17. Dial and Table Reading	4.8
8. Dependability	7.2	18. Finger Dexterity	4.2
9. Orientation and Observation	7.2	19. Arithmetic Calculations	4.1
10. Visualization of the Flight Course	6.7	20. Mathematics	3.3

The picture of the ideal fighter pilot as obtained from the standards indicated by these officers, supplemented by discussion and observation, is about as follows. He is primarily a person who thinks and acts quickly and accurately. His actions are sharp and decisive and reflect good judgment, superior ability in identifying speeds, altitudes, ranges, other distances, and an alertness to everything which is going on around him. The discussions

with the Squadron Commanders indicated how these traits are exhibited by the superior fighter pilot on a mission against the Germans. Flying in formation at 30,000 feet he sees two enemy planes below. Immediately he senses that the situation is favorable and leaves the formation to make an attack. There is no hesitation to think the situation through logically and to plan his type of attack, angle of dive, and so forth. All that is automatic and was planned long ago. As he leaves the formation he looks up and around to see if he is letting himself into a trap. As he dives down he is eyeing the enemy planes ahead, although constantly looking around, and trying to catch the first clue to what the attacked planes will try to do. He has already anticipated the course the enemy is likely to take and is visualizing the line of attack he will take under various circumstances.

These sources agree that besides the traits previously mentioned the ideal fighter pilot has a strong desire to fly and is eager for combat. He is aggressive, but is cool and collected, has good control of his emotions, and can be depended on to do the jobs assigned to protect the formation and make the squadron as effective as possible. He doesn't leave the formation in the case mentioned above unless he knows that is what the squadron leader expects of him. As he closes in, he is eager and intent, but clear-headed and not choked-up with anxiety. He is aggressive and does not hesitate to pull sharply out of a steep dive or to "rack" the plane around in a tight turn. In the middle of the ensuing fight he may suddenly find himself at a disadvantage, in which case he recognizes immediately that it is the part of wisdom to get out along with the wingman who has been sticking with him so that they can come back again tomorrow.

He was well oriented when he left the formation and knows the shortest and best course back to his base. He has also remembered to see that he had enough fuel to get back to this base.

There was a considerable range of ages included in the opinions of these squadron and group officers concerning the ideal age for fighter pilots. The consensus seemed to favor 20 through 27 as the best ages. The commander of one P-38 squadron stated that at about 25 pilots began to lose their eagerness for low flying. This was confirmed by other officers though it was stated that there were many exceptions. It was also the general feeling that the boys of 19 and 20 were immature both socially and emotionally and required more "looking after" by the commanders than did the older pilots.

This study indicates that the present pilot stanines do include most of those aptitudes and traits essential for success as a pursuit pilot. However, a special fighter pilot stanine in which scores on certain tests such as those on speed of decision and reaction were emphasized more than they have been in the pilot stanine would make it possible to select more accurately Aviation Cadets with special aptitude for this work. The other finding of considerable importance is that to obtain the maximum effectiveness in pursuit squadrons and to cut down attrition rates in fighter groups, the standards in terms of the special aptitudes found to be essential for this duty should be raised even higher than the increased standards which are currently in effect.

Selection of Bomber Pilots

As mentioned in the discussion of fighter pilots it is believed that both the bomber pilot groups and the fighter pilot groups could be

substantially improved by simply taking the pilots in these groups and reassigning some of them. However, this would be a very difficult and inefficient procedure, and it is much more desirable to see that the original classification and assignments to the various types of pilot training are in accordance with the aptitudes and other psychological characteristics of the Aviation Cadets being assigned. The study of success in two and four-engine transition training has already been mentioned. That study indicated that for bomber pilots the intellectual traits deserved greater emphasis than the sensori-motor aptitudes involved in coordination and technique.

This finding was strongly supported by the follow-up on about seven hundred pilots and copilots in heavy and medium bombardment groups. It was found that a number of men whose aptitude for rapid learning of the coordination of movements of their hands and feet was so low that they had difficulty getting through flying training schools, had become very acceptable and in a few cases definitely superior first pilots in heavy bombardment groups. This was especially noticeable in B-17 groups. The men who were found to have been doing especially well were found to be superior in judgment, maturity, and leadership. Greater than average size and strength were also found to be characteristic of superior heavy bomber pilots. This was particularly true in B-24 groups.

A finding with important implications for policies of selection and training was that the men reported to be doing the best job in operations as heavy bombardment pilots were 23 to 27 years old. The tendency in training has been to eliminate a larger proportion of these older men than of the younger men, chiefly because they are a little slower than the younger men in learning the skills necessary for precision flying.

As in the case of fighter pilots, bomber pilots who had been given high pilot stanines as a result of their scores on the classificatior tests were making superior records in combat. However, as indicated by the remarks above the aptitudes and abilities which lead to superior work as a bomber pilot differ more markedly from those required for success in flying training schools than they do in the corresponding case for fighter pilots.

A significant relation was found, nevertheless, between the pilot stanines originally assigned and the Squadron Commanders' and Operations Officers' ratings of success in combat operations. Pilots with pilot stanines below 5 were usually found to be doing inferior work. It should be noted that because of the recency of graduation of these pilots from training schools, most of them were found to have come to the theaters as co-pilots. Some typical comments made by Squadron Commanders and Operations Officers concerning pilots with low aptitude scores are the following. (1) "Will not be a first pilot. Wants to do a good job but doesn't want too much responsibility," (2) "Below average in general. Have to check on him to see that he does assigned tasks," (3) "Isn't too clean. Appearance poor. Doesn't look like a pilot. Not too eager to do a job. Went to sleep over enemy territory," (4) "Is rather weak copilot. When he gets too much to drink he starts telling about how good he is," (5) "Pilot not satisfied with him. Was weak copilot," (6) "Had trouble with formation flying at first," (7) "Little knowledge of plane and engines," and (8) "Is first pilot on crew here to do his 25 missions. Not especially eager from point of view of crew spirit or effectiveness of job. Strictly a wing man. Has aborted on two missions for minor difficulties. Down in channel once,

out of gas. Crew always last dressed and last out to their plane."

The comments on the pilots with high aptitude scores who had been around long enough to be observed by the rating officers were typically as follows. (1) "One of the most promising copilots in the squadron. Will make a good flight leader and possibly a squadron leader," (2) "Is a very good pilot. Is now a copilot and is being considered for a new crew commander. Doesn't want a new crew since he wants to finish his missions and get into a pursuit squadron as a P-51 pilot. Is small and very wiry. Doesn't like B-24's. Is very good in formation flying," and (3) "Is one of the copilots who is better than his first pilot. Usually changes places with pilot so as to fly formation for him. Has very good judgment and is the backbone of the crew."

One hundred and seventeen Squadron Commanders and Operations Officers in heavy bombardment squadrons in the Eighth and Fifteenth Air Forces who had had a substantial amount of experience in combat operations indicated the minimum standards desirable for heavy bombardment pilots. These were obtained on the form described in the discussion of fighter pilots using the scale previously described. The various aptitudes and traits are given in the order of the importance attached to them by these officers in the table below.

Minimum Acceptable Standards for Heavy Bombardment Pilots

1. Judgment	7.3	11. Coordination	6.0
2. Emotional Control	7.3	12. Serial Reaction Time	5.9
3. Speed of Decision and Reaction	7.2	13. Leadership	5.9
4. Division of Attention	6.8	14. Reading Comprehension	5.7
5. Dependability	6.5	15. Dial and Table Reading	5.6
6. Memory	6.4	16. Orientation and Observation	5.5
7. Visualization of the Flight Course	6.4	17. Finger Dexterity	5.0
8. Motivation	6.4	18. Arithmetic Reasoning	4.7
9. Estimation of Speed and Distance	6.1	19. Arithmetic Calculations	4.5
10. Mechanical Comprehension	6.0	20. Mathematics	3.9

The picture of the heavy bombardment pilot as obtained from the standards indicated by these officers supplemented by discussion and observation is as follows. He is primarily a person of mature judgment who is steady and cool in combat. It is more important that he make the right decision than that he do something immediately. He is reliable and dependable and remembers what he is to do, and carefully divides his attention among all the many things that he, as first pilot and crew commander, has to do.

The bomber pilot typically has much more to do between missions than the fighter pilot. As crew commander he is responsible for both his crew and his airplane. He must see that they get training and the necessary practice, and that they keep their equipment and also themselves in good shape. He must assist his men in adjusting to the combat situation and set them an example of coolness and eagerness to do a good job. This responsibility gives him a more mature attitude and impresses on him his position as an officer and a leader.

On a mission the crew is in his hands and he is responsible for getting them off safely and getting them back. If they are hit or lose an engine, he must decide whether to stay with the formation, to go to a lower altitude, to crash land, to bail out, or to ditch.

The attitude of the crew members talked to was that they would gladly let some other crew have the hottest pilot in the group or the one most likely to win the war single-handed, if they could have the man who, when in a tough spot, where a decision which might mean life or death to them had to be made, would quickly collect and evaluate all the evidence available from his crew and his instruments and make the best possible decision under the circumstances.

The present study indicates that there are important differences

between the aptitudes and other psychological characteristics which are necessary for graduation from flying training schools and those which are essential to success in combat bombardment operations.

It is very important in improving the efficiency of combat operations that personnel be classified and assigned with reference to the specific aptitudes and traits which commanders in combat operations have found essential for successful bombardment work.

Selection of Navigators

The navigational problems are difficult in heavy bombardment groups in the theaters of operation included in this survey. Although the navigators coming into the theater have usually been in training at least a year, the statement was repeatedly made by group navigators and squadron commanders that when a new crew is turned loose over England with a map, they can be expected to be lost in between five and ten minutes. This apparent lack of ability is to a large extent due to the strangeness of the territory and maps, the poor weather, and the unfamiliarity with the special navigational devices which are used so extensively over England. The deficiencies in knowledge of British radio navigation methods and the use of the Gee box are specific and can be readily taught. Deficiencies in pin-pointing and map-reading are more serious and frequently reflect a basic lack of a special aptitude which can only partially be compensated for by the use of other methods. Fortunately, in most cases his aptitude is sufficiently high that a couple of weeks training and practice enables the new navigator to do a satisfactory job.

About three hundred officers who had taken the classification tests

eighteen months earlier, and had been through navigation training and were now serving as navigators in heavy and medium bombardment groups were followed up. The agreement between the ratings of success in combat operations given these navigators by their superior officers in the squadrons and groups, and the navigator stanines obtained by them in the classification centers was the closest of that for any of the types of aircrew duties. It is believed that the major reason for this was the fact that every mission for the navigators was a sort of test. When he returned he turned in his log. This was usually carefully examined by his superior officers to see how well his entries indicated that he knew where he had been and when. Since the group usually flies as a unit, the logs of all of the navigators should agree as to the actual course, the time various check points were reached, and the weather observed. It is especially revealing to find out which navigators in the formation knew where they were, as shown by their logs, on a mission in which conditions were bad and the lead navigator got lost.

In addition to the close agreement between stanines and performance the other important finding from the follow-up was that the ability of the navigators was generally good. Because standards for qualification for navigator were raised to a navigator stanine of 5 or better in July 1942, there were not many very inferior navigators found in these groups. Although the officers with navigator stanines of 5 and 6 could usually be expected to do an adequate job, it was clear that the raising of the standards to 7 or better last fall will result in a desirable improvement in the general quality of combat navigation, and provide a larger proportion of these officers who are qualified to serve as lead navigators.

Some of the navigators with stanines of 5 and a few with lower

navigator aptitude who were sent into training before the standards were raised were found to be rather weak. The Squadron Commanders and Group Navigators had comments such as the following to make about these officers. (1) "A weak navigator, now missing in action. Although he had studied RAF procedures at a training school for two months after arriving in the theater, he said he wasn't a good navigator. He couldn't remember very well and had to be reminded to do things. He seemed nervous. On one mission he couldn't tell the pilot where they were or give an estimate of time of arrival at the base," (2) "Not a very good navigator. His logs were a little below average," and (3) "A very lazy navigator. He would just as soon walk out of class as not. On a mission or training flight if the pilot called on the interphone to find out where he was, he would quit reading the comic book or magazine he had and start trying to find out where he was. Was transferred to the new pathfinder group."

The typical comments about officers with navigator stanines of 7, 8, and 9 were as follows. (1) "Is a good navigator. Very eager. Is likely to be squadron navigator. Has initiative, can think for himself, and takes responsibility," (2) "Is good navigator. Crew in line for lead. Has good judgment as shown by the fact that he persuaded his pilot to come back from Kiel when they had only two engines left instead of going to Sweden," (3) "Keeps best log of anyone in group. His entries are much more complete than those in the average navigator's log," (4) "Is an outstanding navigator. Works on navigation theory on his own initiative," and (5) "Is lead navigator. His personality isn't impressive and he is very quiet. The officers in the group were surprised to find he was a very good navigator. His logs are exceptionally good and he is a good thinker."

The Squadron and Group Navigators at the medium and heavy bombardment stations visited were asked to indicate the minimum standards on the check list previously described which should be used in selecting navigators for combat duty. These standards for the twenty traits included are given after each of the traits in the list below. The traits are listed in the order of importance according to the average of the standards assigned by the seventy-seven navigators who indicated their judgments.

Minimum Acceptable Standards for Navigators

1. Orientation and Observation	7.8	11. Estimation of Speed and Distance	6.6
2. Emotional Control	7.3	12. Leadership	6.6
3. Dependability	7.2	13. Motivation	6.5
4. Judgment	7.1	14. Visualization of the Flight Course	6.4
5. Speed of Decision and Reaction	7.1	15. Arithmetic Reasoning	5.9
6. Reading Comprehension	7.0	16. Serial Reaction Time	5.9
7. Arithmetic Calculations	6.9	17. Mathematics	5.5
8. Memory	6.8	18. Mechanical Comprehension	5.3
9. Division of Attention	6.8	19. Finger Dexterity	5.0
10. Dial and Table Reading	6.6	20. Coordination	4.8

The pattern of abilities needed by a navigator to do a superior job in the type of operations in which the heavy bombardment groups of the Eighth and Fifteenth Air Forces have been engaged, as presented by these officers and supplemented by observation and discussion, is fairly clear-cut. More than any other member of the aircrew, he needs the academic aptitudes and skills which are necessary for school and college work. These include reading comprehension, memory, arithmetic calculations, and arithmetic reasoning. Rated as more important than any of these academic traits is another intellectual factor, namely, judgment or the ability to make correct decisions when faced with complex practical situations.

However, all of these intellectual factors are rated slightly below two other groups of factors. First are certain perceptual aptitudes related

to the ability to do pin-pointing quickly and accurately, to identify shapes and outlines rapidly, and to read values rapidly from dials, tables, and computers. Second are certain traits of personality and temperament, the most important of these being the ability to remain cool and collected and to think and act without interference from anxiety or emotion when faced with a difficult situation. The other personality trait is willingness to assume complete responsibility for carrying out all assigned jobs in an effective manner. Certain other traits such as the ability to keep several things in mind at once and to think quickly are reported to be essential.

On a combat mission the navigator's first job is to assist the pilot in getting the plane to the appointed place for forming the group. This is quite difficult when the group is forming before daylight over an overcast or between cloud layers. After the whole force has been formed and starts for the target the main job of the navigator is to get the planes to the I. P. Success in these phases of the mission is dependent almost entirely on his skill in navigational procedures. His proficiency in these skills is dependent on his aptitudes for the academic and observational work involved and the extent and quality of his training and experience. In the target area the greatest demands are on the aptitudes essential to quick and accurate identification of check points and particularly the assigned aiming point at a time when the distractions and pressure are greatest.

The navigator has a great deal of responsibility in making decisions in emergencies. The navigator must know where the plane is at all times and be able to give the exact heading necessary to go to any specified

point at a moment's notice. Superior judgment is necessary when conflicting data are obtained concerning winds and locations to decide which data should be utilized in establishing the course.

The findings with respect to navigators tend to confirm the validity of the combination of classification tests used in obtaining the present navigator stanines and the recent increase in standards necessary for assignment to navigation training. It can also be concluded that these procedures will be somewhat improved if the emphasis on advanced mathematics is reduced in favor of greater emphasis on coolness in emergencies and aptitude for rapid and precise observation and identification. The final conclusion is that the lead navigator's responsibility is so great and the conditions frequently so difficult and complex that only very exceptional navigators should be used as lead navigators.

Selection of Bombardiers

The success of heavy bombardment operations is measured by the ability to get bombs on the target. Although the coordinated efforts of the group as a whole go into making these bombing missions successful, the entire responsibility for getting the bombs on the target after others have succeeded in getting them to the target area rests with the bombardiers. This survey indicates that not only are the bombardiers the most critical members of the bombing team, but also that the quality of men sent into the theaters as bombardiers has been definitely below that of either the pilots or the navigators.

A Captain who had completed a tour of twenty-five missions in the Eighth Air Force reported that the first three bombardiers assigned to his crew could not even be depended on to get rid of the bombs on the signal over the

target. On the other hand, a few very superior bombardiers were found who had been doing excellent work not only on the actual bombing missions, but in developing new ideas on bombing theory and in improving bombing procedures.

In this survey something more than one hundred bombardiers were followed up and information obtained from the Squadron Commanders and Group Bombardiers concerning their work in combat. Unfortunately, most of these bombardiers had not been in the group long enough to have had an opportunity to lead the group. Also, the Squadron Commanders reported that weather conditions were such that they had had very little opportunity to do practice bombing and therefore knew very little about the relative promise of the bombardiers who had come in as replacements in the past three or four months. Because of this situation, the Squadron Commanders did not regard their ratings of these men as very valid or valuable. The men regarded as the most promising or as potential group leaders were sometimes officers who had received very low bombardier stanines, and sometimes officers who had received very high bombardier stanines. Most frequently they were some place in the middle. No men with low stanines actually had served successfully as lead bombardiers.

A few comments by Squadron Commanders which are typical of those concerning bombardiers in these groups whose aptitude for this work was indicated to be very low as shown by their bombardier stanines are quoted here. (1) "Is rough, tough type. Not a very good bombardier. No potentialities for lead. Eager to fight the war and always gets his bombs away on the leader's signal." (2) "Is considered as potential lead bombardier on the basis of his and his pilot's ability. Has lead one mission. Very loyal

to his pilot and his squadron. Has a very pleasing personality." (Group Bombardier interviewed later said that he was not good enough as a bombardier to lead the group), and (3) "About average in effectiveness as a bombardier. Group Commander had to reply by indorsement to the British Air Ministry why he salvoed practice bombs only a short distance from an English village."

Comments concerning bombardiers with relatively high bombardier stanines were typically as follows. (1) "Is the bombardier on an outstanding crew. He is always on the job and seems to be pretty good. He has been on 7 missions and seems cool in combat. Not much is known about his skill as a bombardier. The crew is likely to become a lead crew," (2) "Has had no chance to prove self. When he came had lead bombardiers already selected. Now has only a few missions left. Seems confident and cool," (3) "Will probably be made lead. His pilot says he is a good bombardier. Are going to try to evaluate his bombing skill on the practice range before putting him in the lead."

It is clear from these comments that the officers in command of the squadrons have very inadequate information concerning the abilities and potentialities of bombardiers who have been in the squadron two or three months. Assistance is needed if they are to pick superior bombardiers for lead crews.

Using the same check list used for indicating standards for the other members of the aircrew, 48 Squadron and Group Bombardiers gave their judgments concerning the relative importance of the twenty traits for selecting bombardiers capable of doing superior work in operational duty in these theaters. Since all bombardiers may be called on to use the precision

bombsight and perform the duties normally done by lead bombardiers in most of these groups, these officers were requested to indicate the relative importance of these traits in terms of the requirements for a lead bombardier. The averages of the values indicated as the minimum acceptable standards for the various traits are indicated in the table below.

Minimum Acceptable Standards for Bombardiers

1. Orientation and Observation	7.8	11. Coordination	6.1
2. Emotional Control	7.6	12. Motivation	6.1
3. Speed of Decision and Reaction	7.3	13. Leadership	6.0
4. Judgment	7.0	14. Arithmetic Calculations	5.8
5. Finger Dexterity	6.9	15. Estimation of Speed and Distance	5.8
6. Memory	6.8	16. Reading Comprehension	5.7
7. Dial and Table Reading	6.8	17. Visualization of the Flight Course	5.6
8. Division of Attention	6.8	18. Mechanical Comprehension	5.4
9. Serial Reaction Time	6.5	19. Mathematics	5.2
10. Dependability	6.5	20. Arithmetic Reasoning	5.1

The requirements in terms of aptitudes and other psychological characteristics for successful work as a lead bombardier are quite clearly defined by the reports of these officers. Moreover, this pattern is confirmed by the supplementary data from discussions, observations, and analyses of successes and failures. Because of the relative recency of large-scale training programs for bombardiers and the absence of certain of the most important elements in the bombing situation from the training program, the set of classification tests developed to predict success in bombardier training schools appears to have been somewhat less adequate for predicting success in combat operations than was correspondingly the case for the other aircrew positions.

The two traits which experienced combat personnel rate as most important and which are inadequately covered by the present set of tests are aptitude for accurate observation and identification of shapes and areas,

and the ability to remain cool and collected and to think and act without interference from anxiety or emotion when carrying a heavy responsibility and under enemy fire. The bombardier can do practically nothing on his approach to the target until he is properly oriented and knows where he is with reference to the aiming point. His entire job, once the bomb-bay doors are open, the switches turned on, and the bombsight set up, is to synchronize his bombsight with reference to the Aiming Point, and the most difficult part of this is usually the location of the Aiming Point. A third trait which is rated by combat personnel as of more importance than studies of the training program indicated is judgment or the ability to make sound decisions when faced with practical problems. In combat all sorts of problems arise on the bombing run, and the bombardier usually hasn't enough time to explain the whole situation and get advice from others but must make his own decision immediately.

The remaining traits are in general those which were found important in the training situation such as finger dexterity, ability to remember and apply a systematic procedure involving a series of rapid adjustments to be made consecutively, ability to read dials and tables and use a computer, and the ability to pay attention to a number of things at once and concentrate on those which are most important. These abilities and aptitudes are all reflected in what has been called bombsight technique.

The importance of all of these traits was confirmed over and over again by specific instances of good and of poor bombing. Numerous lead navigators reported that they could not remember a single instance when the lead bombardier in their plane found the target without assistance. Almost every group had had at one time or another a lead bombardier who

consistently dropped short when the opposition was heavy because he was nervous and excited. And there were many stories of exceptionally skillful bombardiers who got their bombs on the target in spite of all sorts of difficulties such as personal wounds, wounded navigators, damaged equipment, extremely short bombing runs, and heavy fighter attacks from the front.

The increased standards in terms of bombardier stanines which were put into effect some months ago for assignment to bombardier training schools should improve the general quality of bombardiers arriving in the theaters as replacements in the near future. However, the addition of certain new tests to those currently in use in the classification testing centers and the revision of the present weighting system for obtaining the bombardier stanine will be necessary before the maximum use of talent for this important type of aircrew duty is achieved.

Selection of Enlisted Aircrew

The general attitude in the theaters of operations visited was that the enlisted gunners were definitely unsatisfactory. To quote one group training officer, "The career gunners are unsatisfactory. They lack either education or the necessary mental level to do their jobs. They are predisposed to avoid thinking and are irresponsible, stupid, and fail to look ahead. Enlisted men should be either good technicians or good soldiers. The present enlisted gunners are neither one."

Many of the officers believe that if the gunners were of better quality German fighters would not be able to fly through the formation repeatedly as they have on some missions in recent months. One tail gunner made the following statement in describing an attack on the way into the

target when the groups were without fighter escort. "An ME 109 came in and opened fire at about 300 yards directly behind us. He closed to about 50 yards. I could see him firing burst after burst at me and I kept firing at him. Neither of us seemed able to hit anything and he finally peeled off and left."

The combat officers regard initial selection as a very important factor in the success of aerial gunners. The report of one Gunnery Officer in describing the recruiting and training of gunners in the groups themselves when they were short of gunners is typical. "We found that we could select from the numerous ground crew enlisted men who wanted to be gunners many men who with only four or five days training were able to go out and do a better job than the trained gunners sent us from the States." Although the very great difficulty in judging the relative effectiveness of gunners makes one hesitate to accept this statement at face value, the report of this officer is quite typical and illustrates the attitude of the Squadron and Group Commanders toward current procedures concerning the selection and training of gunners.

The enlisted aircrew covered a wide range of ages and some men in all age groups were reported to be doing well. The officers stated that the younger men were able to stand the cold and other physical hardships better, but that the older ones were more reliable and made a better adjustment to combat. The younger men are sometimes careless, irresponsible, and emotionally immature. Good gunners varied from 20 to 40 years old. Some of the best were between 30 and 40.

In order to obtain an authoritative picture of the pattern of abilities desirable for the various enlisted aircrew members, ratings were obtained

from officers in the squadrons and groups. The officers who provided judgments concerning the relative importance of the various traits were, in addition to Squadron Commanders and Operations Officers, Gunnery Officers, Training Officers, Armament Officers, Communications Officers, and Engineering Officers. These officers indicated their judgments based on observation over a considerable period of time concerning the minimum acceptable standards which should be required in selecting waist and tail gunners, turret gunners, radio operators, and aerial engineers. The list of traits used in indicating standards for the commissioned aircrew jobs was used and the values reported in terms of the same scale. The averages reported include ratings of 25 officers regarding waist and tail gunners, 8 officers indicated standards for turret gunners, 11 officers indicated standards for radio operators, and 14 officers indicated standards for aerial engineers. These values are shown in the table below.

Minimum Acceptable Standards for Enlisted Aircrew

	Waist and Tail Gunners	Turret Gunners	Radio Operators	Aerial Engineers
1. Judgment	4.7	5.0	5.8	5.6
2. Mechanical Comprehension	5.0	5.5	4.9	6.6
3. Arithmetic Calculations	3.5	3.8	4.6	4.1
4. Arithmetic Reasoning	3.6	3.9	4.4	4.3
5. Mathematics	3.2	4.8	4.1	3.5
6. Reading Comprehension	4.2	5.4	5.3	5.9
7. Memory	4.9	4.5	6.1	5.9
8. Dial and Table Reading	3.5	4.0	5.7	5.5
9. Visualization of the Flight Course	4.2	4.6	3.7	4.6
10. Estimation of Speed and Distance	5.4	4.9	4.0	4.5
11. Orientation and Observation	3.8	3.8	3.9	4.0
12. Division of Attention	5.5	5.5	5.4	5.7
13. Speed of Decision and Reaction	5.6	5.4	5.6	5.6
14. Serial Reaction Time	5.4	5.6	5.4	5.4
15. Coordination	4.7	5.9	4.5	5.1
16. Finger Dexterity	3.9	3.9	5.7	5.2
17. Emotional Control	5.9	5.4	5.9	5.9
18. Motivation	5.6	5.5	5.5	5.4
19. Dependability	5.5	5.4	5.8	5.9
20. Leadership	4.8	5.0	4.4	5.5

These indicated standards supplemented by discussion and observation provide the following picture of the pattern of aptitudes and other psychological traits which should be used in the selection of enlisted men for the various positions on the aircrew. In general it should be noted that the ratings for these men were definitely lower than those indicated as standards for officer selection. The waist and tail gunners primary requirements can be grouped in two sets of traits. The first of these is a set of personality traits including the ability to remain cool and collected in combat, a strong desire to fly and fight, and willingness to take full responsibility for the job assigned. Although initial selection can do much towards improving the general quality of the men with respect to these traits, it should also be noted that training and command leadership have a large part in obtaining satisfactory standards in these respects in combat units.

The second group of traits which is important for waist and tail gunners is much less susceptible to improvement through training and leadership. This group is concerned with alertness and the ability to pay attention to a number of things at once, the ability to estimate speeds and distances accurately, the ability to execute a series of movements rapidly and accurately, and the ability to react with speed and precision when the situation demands. Certain other traits are judged to be fairly important, also, such as the ability to understand the operation of mechanical devices and the ability to remember details.

The way in which these traits are used on a typical combat mission is readily seen. Preparatory to the mission the gunner must have been sufficiently motivated and dependable to make certain that his guns were in

good shape. After they get in the air the gunner must be alert at all times to detect enemy fighters and at the same time take care of other details and observe the location of anti-aircraft batteries or other matters of interest. When enemy fighters attack he must estimate the range accurately in order to open fire at the proper time. He must aim his gun quickly and must press the firing button at exactly the precise moment when the plane is lined up in the proper position in his sights. To be effective in this situation he must remain cool in spite of the fact that the fire of the attacking plane appears to be aimed directly at him.

The pattern of abilities which these officers indicate is required for successful work as turret gunners is quite similar to that for waist and tail gunners. The principal variations are a greater emphasis on coordination and the comprehension of mechanical devices. These seem to be in accordance with the nature of the tasks involved.

For radio operators the pattern differs chiefly by attaching greater importance to memory, finger dexterity, and the ability to read dials and tables quickly and accurately.

Similarly, the aerial engineer is reported to differ from the other enlisted gunners principally in increased standards with respect to ability to understand mechanical devices and technical descriptions and to remember detailed information.

It is clear that special aptitude scores based on tests of the traits which these experienced officers have found to be of most importance for successful combat work would make it possible to classify and assign enlisted men to various types of enlisted aircrew training in accordance with combat requirements.

Since all new enlisted men coming into the Air Forces in recent months have been taking classification tests measuring these various traits as part of the Aviation Cadet classification in basic training centers, this important information can be obtained without the necessity of any new testing.

Principal Findings Regarding Selection and Classification

This survey of operations in the Eighth, Ninth, Twelfth, and Fifteenth Air Forces has established the fact that the aircrew personnel assigned to combat groups in these theaters are considered to be of excellent quality by the officers commanding the combat units. These officers report that the general quality of men selected and classified under the new procedures adopted in January 1942 appears to be better than the quality procured during the preceding two years. The substitution of these new procedures for the two year college requirement not only enabled the Air Forces to obtain the large number of people needed for its tremendous expansion, but also improved the general quality of its aircrew personnel. They also report that the replacements now being sent to them are superior to transferred aircrew personnel who have been selected and trained by the RAF and RCAF. These findings indicate that the procedures adopted by the Army Air Forces to meet the demands of mass selection, classification and training have met the test of combat operations and been found adequate.

It is even more encouraging to report that the follow-up of men whose aircrew stanines placed them at various levels of aptitude for duty as pilots, bombardiers, and navigators indicates that, because of the gradual

increase in selection and classification standards which research has made possible, each succeeding group of aircrew personnel replacements reporting to the theaters during the next two years should be generally superior to the men replaced in everything except combat experience.

The particular patterns of aptitudes which research has established are essential for success in each of the types of flying training schools have been generally confirmed as those of most importance for superior performance of duty of the corresponding type in combat operations. However, to provide the most effective personnel in each combat position certain modifications of present classification procedures will need to be made.

A fighter pilot to be most successful in combat operations was found to require much more ability to think and act quickly and precisely, more alertness, and a more aggressive personality than is necessary for successful work in pilot training schools.

The successful bomber pilot does not require as much aptitude for rapid learning of the coordination of movements of his hands and feet as has been required in training, but the ones reported to be doing especially well were found to be superior in judgment, maturity and leadership. Most of these superior bomber pilots were between 23 and 27 years old.

The navigators selected with the tests and standards which were put in effect in November 1943 should do superior work in combat operations according to the records made in recent operations by navigators having these qualifications. Certain minor improvements can be made in procedures for obtaining navigator stanines which will bring these stanines in even closer agreement with ratings of combat performance.

Bombardiers are regarded as having been of generally lower quality

than navigators or pilots by the officers in command of combat units. The increased standards in terms of bombardier stanines which were put into effect in July 1943 should improve the quality of replacement bombardiers arriving in these theaters, beginning with the April replacements. A significant improvement in the ability of bombardiers to perform their combat duties can be obtained by adding certain new tests to those currently in use in the classification testing centers. Further improvement can be gained by revising the present weighting system to give greater emphasis to aptitude for accurate observation and identification of shapes and areas, and to the ability to remain cool and collected when performing an important task under the distraction of personal danger.

Enlisted aircrew were generally regarded as less adequate for their combat assignments than the officers. Studies of the combat requirements for the various types of enlisted aircrew duty establish the fact that special aptitude scores can be obtained for use in classification and assignment of these men using scores on the aircrew classification tests given them at the basic training centers.

Bombing accuracy was found to be determined to a very large extent by the ability of the personnel in the various lead crews. All of these officers have been through a similar training course and have demonstrated a certain proficiency for this type of work. However, enormous individual differences due to natural aptitudes, temperament, and backgrounds persist and are a primary factor in determining the effectiveness of bombing operations. Information concerning these differences in individuals is available and can be supplied to group and squadron commanders to assist them in the selection of personnel for lead crews.

Recommendations Concerning Selection and Classification

1. It is recommended that to establish a program for the selection of personnel for lead crews six officers and fifteen enlisted men who have had experience in obtaining and interpreting information concerning aircrew aptitudes be obtained from the Classification Centers of AAF Training Command. These personnel should be sent to England immediately to establish an Evaluation and Research Section under the supervision of the Surgeon of the United States Strategic Air Forces in Europe with the following functions:

a. To act as a clearing house for stanine scores and other classification and training records from this country for all aircrew personnel.

b. To develop procedures for the identification of personnel with superior aptitude for pathfinder work.

c. To provide advice and recommendations to squadron and group commanders concerning the suitability of their personnel for lead duties.

2. It is recommended that in forming aircrews in the operational training centers in this country special attention be given to placing superior bombardiers, navigators, and enlisted aircrew with superior pilots. This has been requested by officers in charge of operations in these theaters so that they can pick lead crews made up entirely of superior men. In doing this matching all available information such as aptitude scores, training records, and instructors' recommendations should be used. To accomplish these objectives, it is recommended that one officer with experience in the aircrew classification program be sent to each operational training wing.

3. It is recommended that present aircrew classification procedures be modified by substituting special aptitude scores (stanines) for fighter pilot and bomber pilot for the present general pilot stanine, and obtaining special stanines for the various enlisted aircrew duty assignments. These new stanines should be based on the findings of this survey and other relevant information available in studies performed by the Training Command. Although most of the classification tests necessary for classifying men according to indicated combat requirements are already available, it is recommended that the two or three new tests, the need for which has been emphasized by this study, be developed immediately.

III. Morale and the Effective Use of Aircrew Personnel in Combat Theaters

III. Morale and the Effective Use of Aircrew Personnel in Combat Theaters

Attrition Rate and Morale

Bombardment operations in which the attrition rate has been approximately 5 percent for each bombing mission certainly represent the most hazardous military operations which have been conducted over a sustained period. Mathematical calculations indicate that for an attrition rate of 5 percent applied to the remaining group in the case of each successive mission, only 277 men out of 1000 can be expected to remain after 25 missions. If the number of missions is increased to 30 the number of the original group remaining could be expected to be 215 and correspondingly 166 after 35 missions.

The theoretically expected proportion of men completing 25 missions given above is slightly higher than was found in a group of something more than 1300 aircrew personnel checked through from initial assignment to heavy bombardment groups in the Eighth Air Force to termination of duty with these groups. Fortunately, such severe attrition is not typical of all types of combat operations in the Air Forces visited. In certain units an attrition rate of 1 percent was more typical. Under such conditions 605 of an initial group of 1000 men could be expected to complete 50 missions.

However, whether we consider operations in which an individual's chances are as low as one in four or a little better than one in two of finishing his tour of operational duty, it is definitely a hazardous business.

In the face of this it is encouraging to find morale in these groups generally high and very little actual breakdown of personnel. A number of

instances were observed where groups, after losing half of the planes they sent on a particular mission, nevertheless sent out a full group on the mission the following day.

One Group Commander who had spent some time training heavy bombardment crews in the Second Air Force before going to the Eighth Air Force made the following comment, "The morale is high in the groups here; surprisingly so. Based on the attitude of the crews in the Second Air Force my first question on seeing combat conditions here was, 'How do you keep the crews from aborting?' However, I find that the men here want to go on missions. For example, on a before daylight take-off when one of the planes was taxiing out, one of the brakes stuck. It was decided to take one of the spare airplanes and five of the crew went over to this other plane. In the meantime, the brake was fixed and the pilot decided to stay in the original plane. As soon as they found out what was happening the five men started back for their plane. Two of them caught a ride in a jeep and got in just before the plane was scheduled to take off.

"Sometime later the three crewmen who had been left behind reported to their Squadron Commander who, on hearing their story, immediately got in touch with me and we called the plane from the tower. The plane was by that time in formation with the group and the pilot was quite reluctant to come back. They had put a waist gunner in the tail and had the flight engineer doubling as a radio operator. All of the members of the crew were disappointed when they had to pull out of formation and return to the field, even though they would have had to fly a good distance over enemy territory with only a part of their guns manned."

The newcomer, as he watches the formation come back over the field with its vacant spots, only some of which are usually accounted for later by

stragglers and planes down at other bases, then "sweats in" the damaged planes, watching the ambulances rush the wounded off the field, and finally inspects some of the riddled planes that brought their crews safely back, cannot help asking the question as to just what it is that keeps these groups flying and fighting.

It is sometimes suggested that they must hate the enemy very strongly. Actually, very little hate for the Germans can be found in these groups. The attitude generally seemed to be one of respect for a worthy adversary. Stories about Germans picking Americans out of the channel who had ditched near the Dutch coast were much more frequent than stories of machine-gunning parachutists. In those rare instances where someone did say that a parachute was seen to collapse or to burn, it was usually added that probably they were just accidently hit or their parachute was damaged when leaving the plane, or was set afire by something falling on it.

The attitude toward the enemy seemed to be one of intense rivalry, very much like the attitude towards an opposing college football team just before a big game. There is strong feeling and some bitterness, but the flyers seem to take much more naturally to calling the opposition "squareheads," as was done in certain groups in the Mediterranean, than Huns or some of the other names which Group Commanders tried to foster.

Although there is generally no strong feeling of hate towards the German flyers, there is a definite feeling that the Germans and their leaders are responsible for all this and the flyers resent it. However, it would be an exaggeration to say that any large part of the motivation to keep fighting comes from an adequate knowledge and understanding of what we are fighting for.

As in all wars glory, medals, and other rewards play some part in

keeping the men going. Probably these factors were quite important in the initial decision of some of these men to volunteer for duty in the Air Forces. However, such glamour is too small a "carrot" and too far out in front of them to be a source of any large amount of motivation for these men. The most important factors contributing to the morale of the men in these units are discussed in the following sections.

Group Leadership

The primary factors which this survey indicates are important in keeping these men flying and fighting are the leadership of the group and the character and temperament of the individual. The leadership of the Group Commander and his entire staff is important in creating and maintaining good morale. However, the staff member usually in a position to be of most assistance in maintaining the group morale at a high level is the Flight Surgeon.

The value of a strong Group Commander and a strong Flight Surgeon in this respect is illustrated by the experience of two groups in the Mediterranean theater. These two groups were operating from fields which were quite close together, using the same type of planes and carrying out identical assignments, but with very divergent results. The bombing accuracy of the first group was substantially higher than of the second. The first group also had a lower proportion of abortive planes and there were many less cases of anxiety neuroses than in the second group. The differences between the two groups seemed to be almost entirely the results of the different quality of leadership from the Group Commanders and Group Surgeons. This was confirmed by the records of the second group when given a strong Group Commander and a strong Group Surgeon.

A comparison of these good and poor leaders reveals that the good leader knows his men and knows their jobs. It was conspicuous that in the groups with the best records the Squadron Commanders knew the personnel under them who were included in the special follow-up of this study, much better than did the average Squadron Commander. The comments of the better Squadron Commanders also showed more insight into the minimum standards required for superior work in various positions in the aircrew. This was shown by the closer agreement of their ratings with the group consensus.

In addition to knowing his men the superior leader was interested in their welfare and in taking care of them. He took an active interest in seeing that their food and living conditions were the best that could be provided, and made sure that definite plans were made to see that they got adequate rest and recreation when the military situation permitted. The good leader also got promotions and awards for deserving men under him. It should be emphasized that this interest in the health and welfare of the men did not extend in the case of the good group leaders to any pampering or relaxing of the requirements that they meet combat demands promptly and efficiently.

Special note was taken of the characteristics of the Group Surgeons and Flight Surgeons in groups with good and poor records. The Flight Surgeons doing the best job were strong, steady, masculine and aggressive personalities. They also took a real interest in the welfare of the men. However, as in the case of the superior commanders, this sincere interest in the individuals in the combat units was always oriented around the fact that the group had a job to do and the primary consideration was getting this job done. There was a tendency for the weaker Flight Surgeons to

identify themselves too much with the individuals and to sympathize and make excuses for them. They tended to be passive rather than aggressive in their own personalities and protected the men instead of building them up and toughening them mentally.

The normal situation after a new crew gets into combat operations is that one or two of the men will come in, especially the younger ones or those who have been sheltered at home and report that they get pains in the knees, vomit, or have pains over their sinuses when they go to high altitude. Or, they may report that they have diarrhea or can't sleep when alerted. This is likely to happen after about 5 or 6 missions for the aircrew officers and sometimes before the first combat mission for the enlisted men.

A Group Surgeon with a strong, masculine, rough and ready appearance, who had one of the best records for keeping his men flying of any of those visited, described how they handled such cases. "We don't baby the boys, but neither do we give them the 'brush off' when they come around to tell us about such symptoms. We listen to the boy, tell him that such symptoms are fairly common in new men, and try to let him work out for himself the best thing for him to do about it. Being patient and understanding, but, at the same time, offering no encouragement to any signs of weakness seems to be the most effective procedure. Under no circumstances should you say to a man who comes in and says he vomits at high altitude, 'Why you yellow - - - the only trouble with you is you're scared.' "

A study of the records of the better groups leads to the opinion that although some of the other factors are important a strong Group Commander and a strong Flight Surgeon can keep the morale and efficiency of a typical

group of flying personnel at a high level and, by means of the group attitudes which they help to develop and the wise use of rest and recreational facilities by the Flight Surgeon, prevent almost entirely the type of anxiety cases which sometimes develop during the early part of the tour of duty.

It is certainly difficult to overemphasize the importance of leadership in effective combat operations. Although experience indicates that there is a great deal of truth in the statement that, "Leaders are born and not made," the findings of this survey certainly indicate a need for more training of Air Force officers in leadership and command responsibilities.

It has been indicated that the good Group Commander and Flight Surgeon take a good deal of interest in the welfare of their personnel with reference to such things as food, living conditions, rest, recreation, medical care, promotions, and awards. However, it should not be concluded that these factors are in themselves of primary importance in keeping the men flying and fighting. The human being is very adaptable and, if necessary, he can exist and function quite efficiently in conditions far more primitive than those to which the people of this country have become accustomed.

The primary motivating force which more than anything else keeps these men flying and fighting is that they are members of a group in which flying and fighting is the only accepted way of behaving. The aircrew combat personnel are closely knit together, first because they fly, and second because they fight. In combat operations they live together and have little contact with people outside the group. They are usually too far away, too busy, and find transportation too difficult to make any friends outside the group during the relatively few months or weeks they are in the group. Under

these circumstances the individual identifies himself very closely with the group. He takes great pride in his membership in the group and wants to be told that the job they are doing is a very important one and that their operations are effective. He is especially sure that the personnel and special operational procedures of his group are superior to those of other groups. The task of creating and maintaining these group attitudes falls directly on the group leaders. The leaders must command the complete respect of those under them so that they will have fullest confidence in their decisions.

It is surprising to see how closely the activities and interests of the personnel in a group are tied up with their own unit even to the exclusion of other groups in the same wing which may not be located more than three or four miles away. If another group across the road suffers a big loss, the personnel say that's too bad, but it doesn't particularly shake them. They rationalize that that's what happens to groups that don't keep their heads where they belong.

This general feeling is illustrated by a remark made at lunch in one of the groups in a bombardment wing in the Mediterranean. On the two preceding days the Fifteenth Air Force had gone to Styar and Regensburg losing about ten percent of the attacking force on each occasion. However, two groups in this particular wing had borne the brunt of the attack. On the first of these missions one of these groups lost 14 of 35 planes sent out. On the second another of these groups lost 12 of a fairly similar number of planes. The conversation at this other group which had not been badly hit got around to the basketball league which had been started in the wing to provide recreation and bring some of the personnel of the various groups

together. In discussing the standing of this group in the league one of the pilots remarked, "Our chances have improved a lot in the last couple of days and if one more group gets hit like these other two have, we might win the pennant." This was accepted by the others as a rather grim but humorous joke on these other groups.

The good Group Commander, Flight Surgeon, and other staff and command officers have a great opportunity and responsibility in setting the pattern of thinking and accepted attitudes for the members of the group. However, group attitudes are not established by directives and there may be stronger leaders outside of these staff and command positions than in them. A strong copilot or even enlisted gunner may carry a crew and one strong crew commander may carry a squadron. But spontaneous leadership may be bad and misguided as well as good. Therefore, the formation of group attitudes cannot safely be entrusted to whatever leadership happens to arise in a group, but must be assured by selecting strong leaders for the command and staff positions.

Character

The preceding discussion has dealt with the individual members of the aircrew as though they were all alike and showed no individual differences. This is, of course, far from true. The character and temperament of the individual are important factors in determining his adjustment to the combat situation. A person of good character is one who identifies himself as a member of the group and accepts the general attitudes and responsibilities of group members. He is a team player. A person lacking in character does not identify himself with the group and refuses to adopt the group point of view. He is an individualist. In very simple terms character is merely a

matter of whether the individual puts the welfare of the group or his own personal welfare first.

The character of the individual in this respect seems to arise from various sources. However, it is clear that it is not easily altered by the time the individual attains military age. An administrative officer in the Air Force who came to the attention of this observer quite informally provides an extreme example of the type of individual who is quite lacking in character. This officer was a Major. After a few drinks he stated that this was someone else's war and he wasn't going to "stick his neck out." He had been assigned to the Ninth Air Force, but reported that when it appeared that this group might move on to the continent when the invasion started and might be under heavy enemy fire and live rather primitively for awhile, he arranged a transfer to a replacement center in Ireland.

Fortunately, such extreme individualists were very rare in the Air Force Units overseas. It was the opinion of the personnel in these theaters that most of the men of this type had arranged to stay in the Zone of the Interior for the duration.

Cases of men of strong character were so frequent as to be accepted as a matter of course. Examples are: the Group Commander who set himself up to lead the wing on the next day's mission an hour after having been informed that his group had lost forty percent of their planes that day; the bombardier who, when severely wounded on the bomb run, wiped the blood from the eyepiece of the bombsight and continued his run; and the fighter pilots who stay on to protect a crippled bomber which is being attacked when they know their gas supply is getting too low for them to be sure of making their field.

This concept of membership in a social group appears to be very

fundamental and to apply for a wide variety of types of groups. The smallest unit to which it ordinarily applies in the Air Force is the crew. If the crew commander has men of basically sound character to work with, he can develop a crew spirit which is a big factor in keeping these men flying and fighting. The squadron is a somewhat larger group with which the man may identify. The next larger unit, the group, is usually the biggest group with which there is an intimate sense of belonging. After this come various administrative units finally leading up to the U. S. Air Forces as a whole, the Allied military forces, and the peoples of the Allied nations. It takes a good deal of imagination and perspective to feel any close attachment to this last mentioned group, and it appears that it is only a minority of the aircrew members who achieve a genuine feeling of close affiliation with these larger groups. The ties to the larger group are those which lead men and women who do not expect to be drafted to volunteer for service and it is known that these numbers are relatively small. Fortunately, loyalty to the crew or squadron of which the individual is a member can, if the leader has developed appropriate attitudes, be practically as effective with men of good character as the higher loyalties to which are attached the ideals and principles for which this war is being fought.

Temperament

In addition to character the other fundamental way in which people differ which keeps some fighting while others stop or become ineffective is temperament. The principal aspect of temperament in this regard is the extent to which the individual has a fundamental predisposition to develop anxiety when under stress. This tendency to become agitated over a situation involving personal danger which is referred to as anxiety was found to

be fairly specific to the situation in which it was originally acquired (or in which the danger was originally perceived). Anxiety is acquired in much the same way as are such things as specific reactions of attraction and repugnance by associating the place and circumstances of a vivid emotional experience with that experience. Thus, a bombardier who turned around after completing his bombing run to see his navigator breath his last gasp was reported to show signs of emotional agitation only on the bombing run and to appear to be perfectly cool and collected at all other times. In another case a copilot who showed marked anxiety in the cockpit due to previous experiences seemed very calm and efficient when he rode as a tail gunner.

On the other hand, there is also a tendency for anxiety to generalize or spread to a lot of other superficially similar situations. One of the most commonly observed examples of this is the tendency for anxiety, which is produced in a situation in which there is a lot of gun fire, to spread so that all kinds of loud noises evoke anxiety symptoms.

Severe anxiety is incapacitating in its effects, and persons who have developed a substantial amount of anxiety are likely to be not only of little assistance to the rest of the group, but actually definitely detrimental on a mission. One example of such a case was provided by a Squadron Commander who told of taking along as copilot on a certain mission an officer who had been returned from the hospital after treatment for "operational exhaustion." This officer seemed to have made a good recovery and was fine until the planes crossed the coast line and got over German territory. He then went completely to pieces and couldn't follow the simplest instructions from the pilot, talked excitedly on the interphone, and was generally

a liability to the pilot and a disturbing factor to the crew.

The proportion of men "breaking down" to the point that they had to be removed from flying status in these theaters was very small, however. Practically all aircrew members show some signs of being a little nervous and "keyed up" while they are on operational duty. It was reported that the susceptibility to developing symptoms increased as the individual became generally tired due to an excessively heavy load of operational duty. Another factor contributing to the development of such symptoms was previous experiences involving anxiety. If these previous experiences produced anxiety which spread to other situations and was reinforced by later experiences rather than eliminated, any new emotionally upsetting situation would be likely to be stronger because it would probably be added on to certain elements of the previous experiences.

The typical situations which tended to produce anxiety in these men were those involving fear of all types. In addition to fear of injury to himself there was fear of injury to friends and fear of failing to do his duty effectively. The tendency of the situation to produce anxiety is directly related to the individual's estimate of the likelihood that the feared event will actually occur. It is also a direct function of the valuation placed by the individual on whatever is being endangered.

Important individual differences were observed in the way various men estimated the likelihood that an event would occur. For example, one man reported that about 1 plane in the 20 from his group participating in a particular mission could be expected not to return, and he was sure that if one were lost it would be his. His objective statistical estimate of his chances did not agree at all with the real subjective estimate which

was determining his attitude towards the situation. Other pilots going on missions where they estimate that 10 of the 20 planes will be lost, nevertheless feel certain that their plane will be one of the 10 returning.

Men who are new to combat are especially susceptible to wide fluctuations in their estimates depending on small specific occurrences. If a new crew goes on its first mission with a pilot who has been on missions before but who, nevertheless, gets excited himself and starts yelling on the interphones when opposition is encountered, they are likely to regard the situation as a highly dangerous one to themselves. On the other hand, if their first mission is with a very calm commander who takes the attitude that it's all in the day's work and directs their activities in a cool and reassuring manner, they are likely to minimize the danger to them personally. Another instance of the importance of suggestion in estimating the danger of a combat situation was provided by a new fighter pilot. This pilot reported that the Germans were very ingenious, they made the radio-jamming noise sound as though it was saying over and over again, "You'll never get back, you'll never get back," and so forth. Another pilot in the group immediately said, "Oh, you can make it say anything you want to."

The other factor in the individual's reaction to the situation, his valuation of whatever is endangered, also shows large variation from one individual to another. As soon as the likelihood of a feared event's happening gets large, it is necessary for the individual to devalue the relative importance of the thing threatened, if he is to prevent an excessive amount of anxiety from developing. In combat operations such as those visited it is essential that the lives of all of the individuals in the group, including his own, be discounted in relation to the importance of

the work being done if losses are to be prevented from causing excessive anxiety. If the results being obtained are believed to be poor, the situation becomes very difficult to rationalize.

All of the factors concerning the individual such as his fatigue, attitudes, estimates, evaluations, and previous anxiety experiences tend to effect the individual to a greater or lesser extent according to the extent of predisposition towards anxiety which is characteristic of his temperament. It is therefore important to evaluate the individual's temperament as one aspect in determining his suitability for combat aviation. The facts obtained in this survey provide the basis for constructing a screening device for eliminating those showing too great a predisposition for developing anxiety.

Administrative Procedures

Although it is highly desirable to eliminate at the outset those individuals showing marked predisposition of this kind, it is believed that good leadership in the groups can prevent any very substantial loss in efficiency due to this cause. The nature and origin of anxiety as discussed in the preceding paragraphs provide the basis for the administrative procedures which the Group Commanders and Flight Surgeons have found effective in handling individuals. These are as follows:

1. Since fatigue has been found to be a factor, watch for signs of it and provide rest and recreation when needed.

2. Group attitudes are very important. Be sure that the man believes that the work of the group is important, the procedures reasonable, and the results effective.

3. Obtain the strongest leadership available for the new crew member

and for the individual who is having trouble in adjusting to combat operations. Many cases were found in which a strong pilot has taken over a faltering copilot and built up his confidence to the point that he could take a crew of his own. Individual example and leadership is the most effective method of giving the man a reasonable estimate concerning the dangers involved in operations.

4. Because of the initial specificity of anxiety and the way in which it is acquired, the most effective methods of handling relatively severe cases have been found to consist of analyzing and reconstructing the relatively vivid experiences which produced the anxiety. This procedure, if carried on under conditions which tend to make the experience seem more commonplace and natural, tends to counteract the unreasonable repressed fear which has become associated with this specific situation. Although it is ordinarily most effective to strike at the source of the anxiety in this way, it is sometimes desirable at the same time to shift the individual at least temporarily to a new situation. This is illustrated by the fairly common procedure of switching a copilot to the position of Assistant Operations Officer, in which capacity he is tail gunner when the squadron leads the formation. Another procedure used is to switch the man to a special assignment not involving operational flying for a few weeks until he becomes very eager to return to operational duty. If none of these is effective, a complete change to a new type of aircraft with new conditions and new problems has frequently been found to be effective.

The foregoing discussion makes it obvious that no one who has had a substantial amount of experience with combat personnel and gained a real understanding of the factors involved in adjusting to combat operations

would attempt to give the men a "pep talk" and send them out on another mission. This was attempted in a few cases before sufficient experience had been gained and was definitely a failure. The men who were patted on the back and told to be heroes and not quitters were reported to have "panicked" frequently on their next flights.

Factors Detrimental to Morale

Certain factors were found to be tending to lower morale in the units of the Air Forces visited. The principal factor of this type was found to be lack of confidence in the American public, the government, and higher headquarters. It was reported to be very difficult for a Group Commander to develop strong morale in his group and to get them to identify closely with the American people's struggle to provide world freedom when the stories from the States are principally concerned with strikes, black markets, the difficulties of getting home from a winter vacation in Florida, salaries of $65 a week for boys just out of high school, the problem of getting gasoline for pleasure driving, and the annoyance of having to use rationing points in buying food. There is very little indication in the news these men get from home that any substantial number of people back there are making a genuine sacrifice to further the war effort. The Commanding Officers reported that the failure to impose realistically heavy taxes on the inflated salaries and large incomes resulting from the war activities, the many reports indicating what seems to the men to be an undue interest by the members of Congress in party politics, the apparent lack of interest in enabling them to vote, and the apparent disagreement among Congressional leaders concerning post-war plans has produced in the minds of the aircrew men doubts concerning the quality of Congressional

leadership.

It is, therefore, probably fortunate that as previously indicated the loyalties and responsibilities of these individuals are most closely associated with the military group in general, and their own Air Force and specific organizational units in that Air Force in particular. In so far as these men think of the ultimate purposes for which they fight, they appear to develop doubts about the fundamental sincerity of character in a group which makes such heavy demands on a few of its young men and demands so little of all others.

Although it was stated by these officers that the actions of the American public and the legislative groups have been definitely detrimental to morale in these units, a much more potent force in raising and lowering morale in these groups is the action of higher military headquarters. The general attitude in the groups visited was one of accepting the tasks set for them by higher headquarters and a genuine desire to do their part in the war effort. However, there was a strong feeling that those who had given them their assignments could do no less than to provide them with the equipment, supplies, and personnel necessary to do their job.

There was some feeling on the part of the personnel that they should be given more and better airplanes, but in general the tendency was to accept what they had as being the best that could be provided for them under the circumstances. In general, the men thought the particular type airplane that they flew was the best in the world for the work they were doing. There was some questioning, however, of why so many B-24's were being produced and sent to Europe when for heavy bombardment in Europe practically all the pilots questioned would prefer B-17's. There was also a similar

questioning of the desirability of producing B-26's as contrasted with P-47's. Here again there was a tendency to accept the situation as being unfortunate, but inevitable.

Supplies were a source of somewhat more "griping" on the part of these personnel. The very bad tasting butter which was frequently encountered in units in England in November and December was a source of the most comments of any food item. The "bacon" was a close runner-up. There was a tendency to accept Spam, C-rations, and powdered eggs as monotonous, but edible if properly prepared. However, why such a bad tasting preservative should be added to the butter, presumably to keep it from melting in England in December, was more than the men could understand. Most of the men who made the mistake of taking some, left it on their plates and tons of it must have been wasted. Similarly the "bacon" was frequently left on the plate.

The other supply item which was a source of considerable complaint was the heating facilities. Many of the groups in England had both inadequate stoves and insufficient coal. In Africa and Italy after more than a year's experience in that theater, the accepted method of heating was still an improvised gasoline burning stove made from an old oil can and with a pipe line and valve taken from a wrecked plane with either flattened and rolled cans or shell cases for stove pipe.

The major complaint against higher headquarters in both of these theaters centered around personnel. These groups did not feel that they were being sent enough replacements and that the replacements they did get were not adequately trained. These complaints came principally from the men who had been overseas from twelve months to two years. The recent replacements

joined them in their denunciation of operational training. The problem of replacements for aircrew personnel was especially acute in the Mediterranean theater. Many of the groups visited were under-strength and the heavy scale of their operations in connection with the Nettuno beachhead and the Cassino attacks was using up their personnel rapidly. The officers were especially complaining that while they needed pilots very badly, some of the recent replacements told of sitting around with two thousand other trained pilots in a replacement center in Tallahassee, Florida for three months unable to get in the air even long enough to collect their flying pay.

On the training side there was much bitterness about the lack of adequate preparation for combat conditions. The point which bothered the officers most was that this training still appeared to them to be inadequate in spite of the fact that a number of officers with several months' combat experience had been sent back to the States so that this combat experience could have been utilized in training establishments.

This leads to their remaining complaints against higher headquarters. First, they state that many of them have had more than their share of combat operations and that, if given the opportunity, they could do a much better job of training men for combat than those currently in the training jobs. Their second complaint is that men sent back to the Zone of the Interior after obtaining a large amount of valuable combat experience are not adequately utilized there. Many of the men who went to England eighteen months or more ago and have seen many new aircrews come and go have definitely lost their eagerness for combat operations and are a liability to their groups. Some of these men are Squadron Commanders who have flown quite a number of missions but are not permitted to fly enough so that they

can finish up and go back to the States. These men tend to be especially upset by the stories told by some of the new replacements concerning how they were selected for duty overseas. A typical story concerns a request for some enlisted men with special training. The request went to a large center in the Training Command where about fifty such men were employed. Although the request specifically indicated that men with more than 90 days' experience were needed, none of the more than thirty men with experience of a year or better were selected, but instead men recently assigned, all having less than six weeks' experience, were sent.

It was reported by practically all of the commanders in these theaters that one of the principal sources of motivation in keeping the aircrew men flying and fighting was the desire to get their immediate job done and get back to the United States. However, there was quite a little concern about what they were going back to. Letters from those who had already gone back were read with great interest, but also considerable disappointment. Much too frequently, they felt, the information in these letters indicated that the returning aircrew officers met with the attitude of, "Yes, we know you're a hero, but please don't bother us, we have all the answers and we'd like to have you take over a special job that won't interfere with what we're doing." After many efforts to break down this barrier and have some influence on training procedures, these men reported that they were giving up and asking to be sent back to combat again. Such an attitude of frustration and futility cannot be expected to provide a sound basis for producing inspiring combat leaders.

This breakdown in confidence in higher headquarters, to the extent that it occurs, tends to disrupt the whole chain of command. The redistri-

bution side of it is especially important in that it is fundamental for these men to feel that their efforts are appreciated at least by the higher headquarters within the Air Forces.

Present Administrative Policies on the Care and Use of Aircrew Personnel

The general policy on rest and recreation in most of the groups was to work seven days a week for a couple of weeks or a month and then take two, three, or four days off. This policy depended to a considerable extent on facilities for rest and recreation. In England where the usual thing was to go to London, there appeared to be more leave of this sort than in the Mediterranean where there wasn't much to do if you did take a couple of days off.

In both theaters there was a general policy of sending crews to a rest home after they had finished about two-thirds of the number of missions typical of a tour in that theater. In general, the attitude was very favorable towards the rest homes though some of the commanders in the fighter groups stated that they regarded rest homes as a waste of time. This attitude is undoubtedly a reflection of the eagerness for combat and low attrition rates which are typical of the fighter groups in these theaters. It may also be due in part to the shorter period of time in the air each day which is typical of operations in most fighter groups.

There did not appear to be a definite policy in either of these theaters with regard to the number of missions to be flown in any given month by a particular aircrew member. There was general agreement that efficiency could be maintained within a rather wide range of missions per month. The officers observed varied from one in the Eighth Air Force who had flown

only 5 missions in 5 months in a heavy bombardment group to another in the Twelfth Air Force who in the first 31 days after he joined a medium bombardment group flew 47 missions. There was fairly good agreement that the ideal number of missions per month for operations such as those of heavy bombardment groups in the Eighth Air Force was between six and eight, and that for medium bombardment or fighter groups in these theaters the ideal number was between ten and fifteen per month.

The policy on awards differed greatly among the various Air Forces and also from group to group in the same Air Force in some cases. In the Eighth and Ninth the policy was to award the Air Medal or a cluster to it for every five missions. The Distinguished Flying Cross was awarded for completing the normal tour. These were awarded quite routinely. In the Mediterranean theater conditions varied greatly from one group to another. In one fighter group the names of two fighter pilots were obtained who had flown more than 80 missions and been sent back to the Zone of the Interior without even the Air Medal.

In the 42nd Medium Bombardment Wing of the Twelfth Air Force an interesting new policy had just been established. Under the new policy the Air Medal or a cluster to it would be awarded to all participating aircrew members of bombing units doing exceptionally good bombing on any mission. Exceptionally good bombing was defined as bombing in which one hundred percent of the bombs are dropped in the general area of the target, and 80 percent of those shown in the "strike photos" are within 200 yards of the target. The "strike photos" are analyzed in wing headquarters and the results reported to the groups the morning following the mission. The groups of this wing were already doing the most accurate bombing of any

wing known to this observer, and it appears likely that this policy will result in a further improvement in the bombing accuracy of these groups. When the policy was established the requirements were set so that unless bombing results improved substantially the men would get less medals than under the previous automatic system of awards. However, the men took much more pride in winning awards under the new system and prized them much more highly.

It seems clear that there should be definite uniform policies established on all of the matters discussed in this section where this has not already been done, and some inspection made to determine whether such variations as are made from established policies are justified by the circumstances.

Disposition of Breakdown Cases

The handling of breakdown cases among aircrew personnel in these theaters had a history of a general trying-out of various procedures and groping for a policy which had eventuated by the winter of 1943-44 in the independent development of fairly similar procedures in the two theaters. The general procedure was to refer such cases to a board known as the Central Medical Board in the Eighth Air Force, and the Medical Disposition Board in the Twelfth Air Force. In the language of the Twelfth Air Force's Memorandum Number 25-11 dated 30 January 1944 these boards handle "cases which are of a medical nature including mental as well as physical, and also cases of flyers who, while not lacking moral fiber, are unable to reach the 'check point.' " In practice these boards also see practically all "lack of moral fiber" cases since the Flying Evaluation Boards usually

wish to be assured that he is "physically fit to fly" and not suffering from a psychoneurosis before they take action.

The local group starts action in cases of "inaptitude" or "lack of moral fiber" and these are referred to the theater reclassification board for final action. Practically no cases of "inaptitude" had come before the reclassification boards in these theaters. In the Mediterranean theater it was reported that there had been a few cases in which it appeared that the pilot's mental reactions were "not quite quick enough for the type of aircraft to which he was assigned." It was reported that these cases were handled within the Air Force by transfer to other types of aircraft.

The categories which were being used in diagnosing cases appearing before the central medical boards in these theaters differed somewhat. In the Eighth Air Force the following categories were in use by the Central Medical Board:

a. Disqualifying physical defects.

b. Psychoses usually unrelated to combat.

c. Psychoneuroses which ante-dated military service and may or may not have been aggravated by combat aviation.

d. Operational fatigue due to continued stress, harrowing experiences, and physical fatigue.

e. Functional symptoms or anxiety states due to the stress of combat flying.

f. Fear reactions such as trembling and a state of panic which are a response to the specific stimulus of combat.

In the Twelfth Air Force a somewhat different set of categories was used in diagnosing the cases seen. The Medical Disposition Board indicated

that the following categories were employed:

a. Disqualifying physical defects.

b. Psychoses usually unrelated to combat.

c. Aero-anxiety neuroses which usually develop before great stress has been experienced among those temperamentally unsuited to the hazards of flying.

d. Aero-anxiety states due to intense stress which develops anxiety in relatively stable individuals who may be expected to recover relatively rapidly with suitable treatment.

e. Lack of moral fiber which is shown by some men whose interest in self-preservation is greater than their feeling of identification with and obligation to the group.

The differences in the categories used in these two theaters are most clearly seen in relation to the disposition of cases diagnosed as belonging in these classes. The first two categories appear identical in the two theaters and these individuals are handled in accordance with Army Regulations which prescribe that they be given a medical discharge, removed from flying status, hospitalized, or disposed of in some similar fashion.

The third category, however, shows some differences. In the Eighth Air Force the policy appeared to be to diagnose individuals as psychoneurotic only if it appeared that they had shown symptoms before becoming engaged in combat flying, usually before entering the military service. The usual disposition was to send them to a hospital for return to the Zone of the Interior on medical grounds.

The policy in the Twelfth Air Force was to classify cases as Aero-anxiety Neuroses in practically all cases where the individual was believed

to be temperamentally unsuited to the hazards of flying. The usual disposition in these cases is permanently grounding the man and transfering him to another unit in the theater for ground duty.

The fourth category which was called Operational Fatigue in the Eighth Air Force and Aero-anxiety State in the Twelfth Air Force included very similar cases in the two theaters. However, the disposition of these relatively strong individuals who had been subjected to unusually heavy stress was quite different. In the Eighth Air Force these men were usually sent to a special hospital to undergo narcosis therapy. After a suitable course of treatment they were in nearly all cases returned to their original groups for either ground duty or combat flying. It is reported that a very large proportion of the first few cases so treated were able to return to combat flying.

In the Twelfth Air Force such men were most frequently returned to the Zone of the Interior for rehabilitation for a second tour of duty, transferred to some other type of flying in the theater, or given rest and temporary ground duty to see if they would make a recovery which would permit their return to combat operations in their group. Very little use was made of special therapeutic procedures outside of the local squadron or group.

The remaining categories used for diagnosis in the two theaters also differed significantly. In the Eighth Air Force the two categories of Functional Symptoms and Fear Reactions include many cases included under the heading of Aero-anxiety Neuroses in the Twelfth Air Force. These cases are individuals who have little or no previous history of personality maladjustment, but begin to show symptoms either before their first combat mission or at sometime during the period of their first five missions. The

usual disposition of these cases in the Eighth Air Force was to return them to their units with the statement that they are physically fit to fly. The local unit usually grounds an enlisted man and reduces him to the grade of Private or starts reclassification proceedings against an officer on the basis of "lack of moral fiber." It was reported that the reclassification board gives the officer the opportunity to resign for the good of the service or otherwise discharges him without honor. As previously indicated such men are usually classified as Aero-anxiety Neuroses in the Twelfth Air Force and as such are permanently grounded and assigned to ground duty in some other unit in the theater.

The last category of those listed for the Twelfth Air Force, Lack of Moral Fiber, includes those cases lacking in character who are motivated solely by self-interests with no regard for the interests of the group nor for the attitude of the group towards them. Such men are diagnosed as showing Fear Reactions in the Eighth Air Force. In both theaters the action is initiated by the local group and is similar to that described in the preceding paragraph.

Certain principles which have guided the policies on diagnosis and disposition in these two theaters are apparent from the foregoing discussion. In the Eighth Air Force the policy has been that men who are not able to do the jobs they were sent over to do should be dealt with severely and sent back to the Zone of the Interior. There is a strong effort made to get everyone possible through the "normal" tour of duty. In the Twelfth Air Force, on the other hand, the policy is to get as much service as possible out of each man. If he can't fly one type of combat duty he may be given a chance at another, and if he can't fly combat he may be assigned to non-combat flying. Those who can't fly are given ground jobs in the

theater and only those are sent back to the Zone of the Interior who are definitely lacking in moral fiber, who are physically unfit for any type of duty, or who it is believed can be rehabilitated for a second tour of duty by suitable treatment in the Zone of the Interior.

The general attitude in both these theaters was that the breakdown cases were more to be pitied than punished. However, in the case of men who refuse to fly because of a lack of character, immediate punishment was believed essential. The statement of one of the members of the Medical Disposition Board in the Twelfth Air Force was, "It is because of the frank and obvious exploitation of the principle of self-preservation that these cases are detrimental to morale and must be met with firm disciplinary measures."

Although the cases of men refusing to fly were rare, the universal feeling of those who had been on many combat missions was that practically anyone could be expected to get "jittery" if they were exposed to a series of severe and harrowing experiences. It was reported that in a study done in the Eighth Air Force almost all of the men interviewed at the time of departure for the Zone of the Interior after completing the operational tour in that theater reported that they had experienced subjective anxiety at some time during the tour. Many of this group of aircrew personnel reported weight losses, insomnia, severe operational fatigue, and loss of efficiency. It should be remembered that these men represented the twenty-five percent who were successful in completing the "normal" number of combat missions.

There was not a very clear understanding on the part of most Group and Squadron Commanders as to the types of diagnosis which were in use in their

theaters. These diagnostic categories had also been changed so frequently that even the Flight Surgeons in the units were not entirely clear regarding them.

One situation which should be noted is the attitude and relations between the combat units and the central medical boards. In general the cooperation between these groups was fairly good. However, some Flight Surgeons reported that the members of these boards were too far removed from combat and didn't have a clear understanding of life in the squadrons. Others reported that the boards did not have enough information to make a sound diagnosis and disposition of the cases. A number of cases were found in which the local surgeon felt a wrong diagnosis had been made by the board. In a few instances the Group Surgeon stated that having discovered the bases for diagnosis and disposition in these cases, the Group and Squadron Surgeons began by deciding what the final disposition should be. They then wrote up the statement to be sent into the central medical board in such a way that the board would be likely to make the particular diagnosis which would lead to the desired disposition.

An even worse situation was found in a few groups in which the Squadron and Group Commanders felt so strongly about certain cases in which they felt the board had erred in their diagnosis that they refused to send cases to the central medical board. These units made their own disposition of such cases.

The procedure which some of the surgeons in the theaters who had had a good deal of experience in such matters recommended was to prepare a clear, uniform policy on diagnosis and disposition which would be followed by all units in all theaters. Having such policies, the squadron and group

headquarters would take the primary responsibility for diagnosis and disposition. The function of the central boards would be principally to supervise the local groups and review the cases to verify the fact that the established policies were being followed. All instances of errors in diagnosis would be regarded as failures by the central board to train the local personnel adequately.

In concluding this discussion on the diagnosis and disposition of breakdown cases, it is appropriate to indicate the extent of this problem in these theaters. A study reported by the Office of the Surgeon of the Eighth Air Force indicated that approximately 4 percent of the aircrew officers and enlisted men entering heavy bombardment groups were removed from flying status before completing their tour of duty. The data obtained from the Mediterranean Theater indicated the rates there were generally similar.

Of the several hundred officers included in this present follow-up study in the Eighth Air Force, only 2½ percent had been sent to the Central Medical Board since arriving in the theater. The average length of time in the groups was between two and four months, and most of these individuals had been on a substantial number of missions. Almost half of the cases referred in this group were diagnosed as having physically disqualifying defects. Some were treated and returned to their units. It seemed very unlikely that there would be as many as 3 percent of the officers in this group removed from flying status before completing 25 missions.

Although it is not believed that these figures represent a serious situation, it is highly probable that the situation can be improved by modifications in selection and classification techniques, by eliminating

inferior Group and Squadron Commanders, and by improved understanding and treatment of the problems involved.

Length of Combat Tour

One of the primary sources of motivation which had kept the aircrew personnel in the units visited flying and fighting was the desire to complete the combat tour and return to the Zone of the Interior. In heavy bombardment groups inquiries concerning whether or not a particular man was eager for combat were met with blank looks or explanations that nobody except the new men who hadn't been on a rough mission yet was "eager for combat."

In fighter groups there were quite a few men who seemed to wake up in the morning with the feeling, "Let me at those Germans," but in heavy bombardment groups such an attitude was practically non-existent. There were men who would constantly urge the operations officer to put them on missions. If their crew wasn't flying they would fly with another crew and they would fill in in any position on the ship. They would give up leave or a planned holiday trip if they could go on a mission. However, the universal explanation of this attitude was that the men were eager to complete their missions and get home.

Such motivation for participation in combat operations has certain distinct advantages. If the individual is motivated mainly by a desire to win the war but because of inferior equipment, bad planning, wrong decisions, and other errors by personnel in his group or higher headquarters, he knows that the work has been costly in lives and equipment and largely ineffective, it is not only discouraging but a real source of anxiety. On the other hand, it still may represent one more mission

accomplished towards completing his tour and from this point of view provide at least a limited amount of satisfaction.

The matter of length of combat tour or number of operational missions or operational hours to be performed is one of great importance and one which has a direct bearing on the effectiveness of the combat operations of an Air Force. The various policies which were in effect in the Air Forces at the time they were visited are described briefly below.

In the Eighth and Ninth Air Forces there was a fairly definite number of missions in a "normal" tour of duty. For heavy bombers this was defined as between 25 and 30 missions. In practice men were usually taken off combat operations after 25 missions. In medium bombers the tour was defined as 50 missions and in fighter groups the tour of duty was defined as 200 hours of combat operations. Personnel completing the "normal" number of missions were permitted to volunteer for a specific number of additional missions. After completing their missions 75 percent of the personnel were sent home immediately and 25 percent retained in the theater. Three months after completing their missions personnel who wished to return to the Zone of the Interior were usually released. Some men volunteered to stay. However, it was common practice to take men off combat operations before completing the "normal" operational tour if it was desired to retain them in the theater. This practice caused a good deal of resentment among some of the officers who were kept in the combat theater by this device.

In the Fifteenth Air Force the "normal" number of missions was 50. However, credit for two missions was given for each mission North of the Alps in the general area bombed by the Eighth Air Force where the fighter

opposition was substantial and a long time was spent over enemy territory.

In the Twelfth Air Force the system was rather different. Instead of a definite number of missions, a system of "check points" was established in an effort "to obtain through individual consideration a maximum effort from each flyer in accordance with his ability." These "check points" were defined as "the estimated number of sorties or operational hours that the average flyer is capable of attaining under normal combat conditions." The "check points" in use were as follows: medium bombardment, B-26 was 45 sorties; medium bombardment, B-25, light bombardment, long range fighter escort, and photo reconnaissance were 50 sorties; fighter-bomber, fighter ground support, and fighter dive bombing were 65 sorties; and fighter patrol and short range fighter escort were 100 sorties. Upon completing the appropriate number of sorties, all flying personnel were examined by their Flight Surgeon.

The report of the examination together with the recommendation in regard to disposition is submitted by the Flight Surgeon to his Commanding Officer and is forwarded through channels with the recommendation of each Commander. Flying personnel who have passed the "check point" may be disposed of through administrative procedure "upon recommendation of the Unit Flight Surgeon at such time as the flyer begins to show evidence of stress." In practice it appeared that quite a few of the men in fighter and medium bombardment groups where the attrition rates were low were able to fly additional missions beyond the check points.

For comparison with these other policies information was obtained concerning the policies of the U. S. Navy and the RAF in regard to tour of duty. The Navy policy has not been uniform throughout the service but has been handled by theater commanders. The policies in effect for the Naval

flyers have been twelve months' duty in Alaska or eighteen months' duty in the South Pacific. The Marine policy has been fifteen months for its pilots. For men in the South Pacific there is usually a period of leave in Australia or New Zealand sometime around the middle of the tour.

The Chief of the Division of Aviation Medicine in the Navy recently made the following statements concerning the use of aircrew personnel in the Navy. "In our earlier operations in the Pacific, we overstressed our flying personnel. ... Many men who survived this period will never again be capable of returning to combat duty. The emotional shock of harrowing experiences has destroyed something of the psychological integrity of these people which neither you nor I are capable of restoring. However, in justification of these facts it must be pointed out that in those early days we were dealing with a situation of emergency and expediency. There was no other choice of action except to make the most of what we had. Now that we are in a position to plan our future campaigns, it is imperative that we profit by those past experiences and make future provisions for more efficient employment of our personnel. ...

"It is believed that a year of duty in the South Pacific area is entirely compatible with military efficiency, provided some such measures of relief for flying personnel as have been described above are provided. For illustration, the following outline might be considered as a general approach to the problem of rotation of personnel: (a) Three weeks in front-line combat followed by (b) a week to ten days in a quiet rest and recreational camp within the general geographical area; (c) thirty days with light operational flight training in the quiet area, and then (d) return to combat assignment. With the second or third cycle of rotation, personnel

should be afforded a liberty in New Zealand or Australia, following which they return, through the rest center and light operational training, to the front. At the conclusion of their normal cruise in the general area, they should be returned to the Continental United States for not less than 6 months to a year of local employment. It is realized that any such plan as indicated above calls for additional pilots and personnel. This may sound extravagant, but I believe in the end wasteful attrition will force us to some such program. It is not easy to set down limits of flight time or missions for every type of employment, but guiding policies for the principal types of activities can and should be established."

It is difficult to get any meaningful comparisons between Army and Navy flyers in terms of sorties or operational hours because the opposition is so variable. A pilot may fly a large number of hours of security patrol over a carrier without ever seeing an enemy plane or he may have two or three weeks of continuous action against intense enemy opposition in connection with the attack of a task force. Although information on attrition rates has not been obtained for these Naval flying operations, available data indicate that the percent of the originally assigned personnel lost in these units in the past eighteen months has not been nearly as great as the percent of initial personnel lost in 25 heavy bombardment missions from the Eighth Air Force during this period.

The RAF attrition rates in heavy bombardment operations over Germany have been very similar to those of the Eighth Air Force. The maximum number of night sorties for heavy bombardment crews is set at 30. However, at the option of the Unit Commander it can be decreased to any figure below 30 considered desirable. If the operational stress has been especially

great the Unit Commander and/or Medical Officer may recommend that the flyer's tour be terminated after 20 sorties. This is rare, however, and the usual practice was to remove members of the aircrew from combat operations after between 24 and 30 missions. The man is not told in advance when he is to be taken off. After completing a tour of heavy bombardment operational flying the man is given non-operational flying for between six months and a year. The usual tour for fighter pilots in the RAF is 200 operational hours or 50 fighter sweeps.

Some discussion of the observed effects of these various policies seems desirable since this is a very important matter vitally effecting the morale and operational effectiveness of these Air Forces.

One of the most striking observations was the lack of eagerness to go on missions near or beyond the "check point" in the Twelfth Air Force. These men appeared to take the attitude which was almost never put into words that they had already put in or would soon have the "normal" number of missions, and to go on a lot more missions was just asking for trouble. It was obvious from their experience and the arithmetic of the situation that if they went on enough missions they would go down. These men had all accepted the hazards of combat flying freely and willingly, but they felt that there were thousands of other pilots who could trade places with them if they were fortunate enough to survive what seemed to be their share of the combat risks. They further felt that this would improve the efficiency of both training and combat operations.

It was observed that this attitude was not nearly so noticeable among the fighter pilots as among the bombing crews. As previously noted, the fighter pilot has numerous advantages in motivation, independence, and

individual recognition which are not shared by the bombing groups.

Another attitude observed in the groups of the Twelfth Air Force which is related to that just discussed was the tendency for the aircrew member to think about his mental health and speculate on how long it would be before he got sufficiently jittery for the Flight Surgeon to take him off combat operations. A group operations officer in a medium bombardment unit stated to this observer in the presence of two or three other officers that "he had had it" in the slang of the RAF and didn't ever believe he could go over the beachhead on a close support mission again. He had been on 46 missions spread out over a relatively long period of time. Practically all of the aircrew personnel who had been with him in the original group had been either shot down or sent back to the Zone of the Interior, and he had seen so many people taken off combat flying by the Flight Surgeons as having had enough, that he had begun to wonder whether he wasn't getting close to the edge.

This attitude was especially noticeable since it was so different from that of men in heavy bombardment groups who were flying a definite number of missions with less than a third as good a chance of surviving as he had. Another attitude which accompanied this was that no one was taken off flying until they were just ready to crack or had already cracked under the strain. Each individual Flight Surgeon had the responsibility for deciding when a flyer had given the maximum effort of which he was capable before showing "evidence of stress sufficient to impair his future usefulness."

This branding of all men leaving the theater as on the verge of mental breakdown and in need of rest and rehabilitation in the Zone of the Interior seemed to provide an added source of anxiety for men who already had

been through a rather difficult experience. This procedure seemed to have some resemblance to the labelling of "shell shock" cases during the last war that caused some of these difficulties to continue for years after the war and become quite an expense to the government.

One other point should be noted in connection with the policy of the Twelfth Air Force. A number of Flight Surgeons recommended practically all personnel in their units for return to the Zone of the Interior for rest and rehabilitation, while others doing the same work recommended very few and made an effort to select those capable of further combat duty. The problems arising from such a situation are obvious.

In the Eighth Air Force individuals were permitted to volunteer for additional missions. The policy and experience in this regard varied from group to group, but in most groups there was not much volunteering. In certain groups there were stories of men who had volunteered for 5 or 10 additional missions and been lost on their twenty-seventh or thirty-third missions. Men were very rarely found in the theater who had put in more than 25 missions and were still flying. The principal effect of permitting men to volunteer for additional missions seemed to be to take away from the more conscientious man who did not volunteer for additional missions some of the satisfaction of feeling he had done his full part. It is believed that the relatively small group of people who had completed 25 missions in heavy bombardment operations over Germany deserved the satisfaction of feeling that they had done all that they could. To have to place himself on record as admitting that he has had enough is not good for the future mental health of these flying personnel. If he were not allowed more than a fixed number of missions except in case of military necessity

he could leave feeling he would like to have been allowed to do more.

The dependents of the men in combat operations also object to their volunteering for additional missions. These dependents write suggesting that they come back home and use their experience to train the new men and let some of the other flying personnel who may be able to do a better job than they, have a chance at combat operations. Certainly there is no doubt but that combat stress and seeing other men come and go over a long period of time in a group tend to decrease a man's eagerness and effectiveness in a combat group.

A study reported by the Central Medical Establishment of the Eighth Air Force indicates the stress these men have undergone by the time they have completed the "normal" tour of duty. In a sample of one hundred and fifty men who had completed 25 missions it was found that 35 percent of the men had either been wounded, bailed out, ditched, or crash landed. Of the men in this sample 80 percent had been in aircraft that were severely damaged, or in which members of the crew were wounded, or which were badly lost in trying to navigate back from a combat mission.

Almost all of the officers with whom the problem was discussed in these theaters, believed that the greatest efficiency in combat units could be obtained by having a definite tour of duty fixed at the time the man joined the unit which would only be changed in the event of military necessity. The number of missions or hours could be varied as attrition rates and other conditions changed, but these changes would not be retroactive but apply to new men entering the groups. The men overseas stated that they believed that the men who had had combat experience could do a better job in the work in the Zone of the Interior than the men who lacked such experience,

and that fresh men would do a better job in combat operations than men who had lost their eagerness.

Redistribution of Aircrew Personnel

Intense aerial warfare of the type first introduced in the present war has created new problems in connection with the use of personnel. Large numbers of men who have been subjected to severe combat stress must be taken off operational flying and given non-operational work for a fairly substantial period of time. In redistributing these men, the most important consideration is to make effective use in the immediate prosecution of the war of the valuable combat experience and training they have had. Other considerations of some importance are the effect of these new assignments on getting the men prepared for later assignments; the ultimate effect on the individual's personality and welfare; and the effect on the attitudes and morale of other personnel.

The problem is a very difficult one because of the distances between the combat theaters and the Zone of the Interior. If it were possible for the officers commanding operational units to talk over the personnel being made available with the officers commanding non-operational units, men could be assigned much more efficiently in terms of the special abilities and aptitudes they had shown in combat.

Under the current system the commanding officer usually writes a letter of recommendation, but he does this without much knowledge of what the opportunities and needs in the Zone of the Interior are. Letters come back to the theater from the men indicating that the recommendations of the commanding officer were not followed and the men in the theaters resent this. The

men in combat operations are keyed up to putting forth great effort to get the war won, and this is reflected in the type of questions they ask about the redistribution stations. They are chiefly interested in knowing what assignment they are likely to get and what procedures will be used in assigning them, and show only moderate interest in how long a leave they will get, or what sort of accomodations they will have in the redistribution stations. Above all they are concerned about whether they will be treated as men who have something to give or men who have to be taken care of.

There is a tendency on the part of combat personnel to take the attitude that anyone who has been through a tour of duty in combat is much better able to do almost any job in the Army than personnel without this experience. However, the abler officers in operational units recognized the inadequacies and weaknesses of many of the personnel returned from the combat theaters.

An officer who has served in one specific group, flying the same type of missions from the same base for several months, has very little perspective on combat operations. He is almost certain to believe that the special procedures used by his particular squadron and group were far superior to those used by any other units in this or other theaters, in spite of the fact that he knows very little about the procedures of other groups or the reasons why his group adopted the methods they were using.

Some of the officers proposed that a school for returning combat men be conducted so as to give them the broader picture of combat operations and make sure that they understood the basic principles upon which specific combat procedures were based. Certainly some procedure is needed for seeing that such men have the information necessary to distinguish between procedures not in current use because they are obsolete and outmoded, and those

which are not in current use merely because they are not the most suitable for certain specific conditions which might change overnight.

Many officers reported that letters received from friends who had been returned to the Zone of the Interior indicated that men with combat experience were not properly appreciated. There was no complaint that the men were not taken into higher headquarters nor was there any resentment that they were not given command or administrative positions. What they wanted was a chance to take an active part in work where they could use what they had learned and they said they were not getting it.

These men had no feeling that the Air Force should treat them like heroes and ask them to pick whatever job they liked. What they did want was to feel that the Air Force was really interested in assigning them not necessarily to what they wanted, but to the place in which they could be of most service. They had been through the thorough selection and classification procedures used in the Classification Centers when they got their original training assignments and accepted this as a fair and efficient way of making assignments. The numerous questions asked clearly indicated that they weren't sure where they could be most useful and would like help in finding out. What they didn't want was to be shoved around like cattle on the basis of what quotas came in the morning they arrived, or where their name fell in the alphabetical list from which their assignment was made. Such procedures can only lead to inefficiency, dissatisfaction, and distrust.

The large individual differences found in these men at the time of original classification were found to have been further accentuated by the intensive training and combat experience they had been through. Some men

had developed and matured in remarkable fashion and were capable of responsible positions while others appeared to have been drained of all initiative and drive.

The thing which it appeared that these men were most interested in doing was making their combat experience available to the personnel in this country. A good beginning on this it was believed could be made through a systematic and comprehensive questionnaire concerning their operational experience. The other thing which these men wished an opportunity to do was to be able to demonstrate in some manner the extent to which they had progressed as officers and leaders in the preceding few months.

The other major complaint of the men writing back to the theaters concerned the way they were treated in the units in the Zone of the Interior to which they were assigned. Many of these men coming back eager to help out in getting on with the war reported that they were systematically ignored and frustrated in all attempts to take an active part in what was going on. They reported that many of the stations were run by a small clique which had been on the field a long time and seemed to be interested in staying. This clique would make a special job for the returnee with a fancy title but nothing to do, or at least nothing which would enable him to make any changes in established routines.

A number of these men reported that they couldn't stand the frustration and futility of the situation and had volunteered for a second combat tour as soon as it became apparent what the situation was to be. This, however, represents a very poor solution to this problem, for observations on this trip indicate that adjusting to a second tour is much harder than the first. An aircrew man has volunteered and then trained for months to get into

active combat and he has a lot of motivation and drive behind him. He tends to accept whatever conditions he finds in combat and adjusts himself to them. However, a second tour is quite different, and he is much more likely to be bothered by conditions in the new theater which were not present in his first tour of duty such as long overwater flights, bad living conditions, rough landing fields, high attrition rates, and bad weather.

An individual who goes out to combat for a second tour because he is frustrated and disgusted is not in a mental frame of mind to provide the leadership which combat units need. It is reported that only 5 percent of the heavy bombardment personnel in the RAF complete a second tour, although they are allowed six months to a year on non-operational flying between tours and the second tour is set considerably shorter than the first. The effectiveness of Air Force personnel on a second tour is likely to be very dependent on the extent to which they feel they have been effectively used after their first tour.

The above paragraphs have painted a dark picture concerning the attitude of the men overseas towards redistribution. It must be assumed that bad news travels more rapidly than good and the malassignment can hardly be as bad as these men picture it. However, so much feeling could hardly have been stirred up by a few disgruntled returned men. In the theaters it is accepted as an axiom that wars are won by utilizing lessons learned in combat more rapidly and effectively than the enemy. It certainly appears that the utilization of aircrew personnel with combat experience in the positions which a careful analysis of their abilities and potentialities indicates would enable them to be of most use to the Air Forces would contribute to shortening this war.

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Summary on Morale and the Effective Use of Aircrew Personnel

The morale in the combat units was found to be surprisingly high in spite of high operational attrition rates and other factors detrimental to morale. The principal factors responsible for keeping these groups flying and fighting in addition to the more immediate motivation of finishing up and getting home were found to be leadership of the group and the character and temperament of the individual. This leads to the conclusion that improvements in the selection of leaders and in the screening of individuals for combat duty with relation to character and temperament can be expected to improve the effectiveness of combat operations.

In general it was found that both the group leadership and the quality of the individual aircrew personnel in these theaters were excellent.

Administrative procedures which were found to be used effectively by superior Group Commanders and Flight Surgeons in maintaining the efficiency of their units included, (1) Proper provisions for rest and recreation, (2) Development of a belief in the immediate and ultimate objectives of the group and the effectiveness of the operations, (3) Effective use of the strong leaders among the aircrew personnel, (4) Provision of an opportunity to de-emphasize a vivid emotional experience by talking it out under conditions which tend to make the experience seem more commonplace and natural, (5) Shifting individuals who had developed strong emotional reactions in specific situations to duties in a different environment involving flying if possible, and (6) Making awards on the basis of the effectiveness of the operations of the unit rather than on an automatic basis.

Only about 3 or 4 percent of the aircrew personnel in these theaters

were found to break down during the time they are in the theater to the extent that they are sent before the central medical board. However, the policies of these boards concerning diagnosis and disposition have a wider effect on aircrew personnel than these figures indicate, and a simple uniform policy for all theaters was regarded as highly desirable.

It was the belief of the officers in these theaters that a sound policy of rotation of personnel with combat experience is essential to effective combat operations. It was further reported that the experience of these officers indicated that the best policy was one which, in so far as the necessities of the military situation allowed, set a definite tour in terms of operational hours or missions. Men would be shifted to assignments in the Zone of the Interior except in case an unforeseen military emergency necessitated their temporary retention. The length of tour would vary for aircrew personnel depending on the type of operations, the amount and quality of enemy opposition, and other conditions in the particular theater.

One of the major concerns of the officers in the combat theaters with respect to the use of personnel was whether aircrew personnel with combat experience were being effectively utilized on return to the Zone of the Interior. These officers stated that aircrew personnel returning from combat duty were highly motivated to assist in training new men for combat and in performing other duties which would contribute to the effectiveness of combat operations. The development of procedures of evaluation and classification which would enable the Air Forces to make the maximum use of the abilities and experience of aircrew personnel who had participated in combat operations was considered by officers in the theaters to be essential to the winning of a long war.

Recommendations Concerning Morale and the Effective Use of Aircrew Personnel

1. It is recommended that a simple uniform policy for the diagnosis and disposition of breakdown cases in aircrew personnel be formulated on the basis of experience in the various theaters and published for use in all theaters.

2. It is recommended that a definite uniform policy on length of combat tour and the rotation of personnel with combat experience to the Zone of the Interior be issued to all theaters. This policy should be based on the need for personnel with combat experience in the Zone of the Interior, and experience in the various theaters concerning the effect on aircrew personnel of various types of combat operations against enemy opposition of various amounts and qualities under the types of conditions prevalent in a particular theater.

3. It is recommended that the psychological research personnel in the AAF Redistribution Center direct its efforts primarily towards the problem of determining the type of duty in which the returning aircrew personnel with combat experience can make the most effective contribution to the general war effort.

IV. Training of Aircrew Personnel

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Introduction

It was not planned that this survey include a study of the effectiveness of the training received by aircrew personnel in preparing them for combat operations. However, it was soon discovered that aircrew personnel could not be discussed with the officers in charge of combat operations without the subject of training arising. Although these officers were informed that the survey was primarily concerned with individual differences which persist in spite of training, they nevertheless insisted on discussing the training deficiencies of the replacements received.

It seemed to make these officers feel better to have an opportunity to transmit their criticisms to a representative of Headquarters, Army Air Forces. These criticisms were therefore carefully recorded and are presented below. It is assumed that many of the conditions reported have been corrected since these men went through flying training. However, the officers in the field stated that improvement of conditions reported in the past had been very slow, probably due to important practical difficulties which prevented immediate modification of certain procedures, and the systematic compilations of these comments may therefore be of value. Although it will be found that the statements are generally very critical, it should be remembered that in general these officers feel that the training program has been well planned and very effective. Their chief complaint concerns the slowness with which the lessons of combat are reflected in modifications in training procedures.

Crew Training

The major criticism of operational training in the continental air

forces was the lack of high altitude formation flying. Hardly any of the officers failed to mention this point. It was sometimes qualified by saying that brief missions at altitude were not adequate and that at least 4 or 5 hours at altitude is desirable. It was further suggested that the formation should be tight and similar to those flown in the theaters in arrangement and size, and that practice should be had in flying all of the various positions in the formation.

These officers stated that the lack of casualties due to anoxia and frostbite in operational training as contrasted with the relatively large number of such casualties in operations were convincing evidence that there was not sufficient use in training of oxygen equipment and protective clothing under conditions closely simulating those of combat. The principal other training condition which was mentioned was the lack of experience in flying in bad weather.

Concerning the instruction of the crew as a unit there was much criticism. It was reported that after certain of the crew members started operational training they did nothing but ride around in the plane and loaf and sleep for several weeks. It was reported that these crew members did not get enough training even to maintain the level of proficiency which they had reached in earlier training courses. Some men reported they were less skilled in their duties at the end of operational training than when they started. There were a variety of suggestions for giving the bombardier, navigator, and enlisted aircrew men training in their specialties and in gunnery while the pilot was getting some of the early phases of his operational training.

More training in which the crew really functioned as a crew and

developed the type of close teamwork needed in operational flying was a frequent recommendation. A similar suggestion was that the training missions should simulate combat missions as closely as possible. They should include briefing, loading and caring for bombs, loading and caring for guns, forming the group, flying the briefed course, and returning as a group. This should include training to improve air discipline which was reported to be inadequately developed.

The general criticism was frequently made that there was too much interest in meeting training standards on paper in terms of hours in the air, bombs dropped, and rounds of ammunition fired. It was felt that there should be more interest in what was learned during the hours in the air, or when dropping the bombs or firing the guns. It was stated that in operational training the graduates of the Training Command schools were "kicked around" and not treated as responsible officers, and that they should be trained to behave as officers and assume the usual obligations of such personnel.

The other general suggestion was that men should be trained for operations in a specific theater under the supervision of officers who had had recent experience in those theaters. At the very least it was suggested that the training in each wing be aimed primarily at operations in a particular theater so that at least a major part of the men would have the type of training especially important for the theater to which they were sent.

Pilot Training

In general the officers in these theaters were quite well satisfied with the skill and technique of the new pilots in handling the airplane.

There were certain suggestions such as more training in taking off and flying close formation at high altitude with a full load of gas and bombs. There was also some criticism of the new pilots for trying to use the three point short take-off in the European theater.

There was criticism that the copilots arriving in the theater frequently had not learned to take off and land the plane yet. A similar complaint in the ferry squadrons visited was that some new single engine pilots had not been checked out on any type of pursuit plane. It was reported that the first transition to a tactical plane of this type was quite difficult if it had to be made after three to six months of no flying at all.

It was reported that most pilots were inadequately trained in using PDI and AFCE in cooperation with the bombardier. This lack of knowledge and practice has had a serious effect on bombing accuracy. Probably the single deficiency of new pilots which has caused a greater decrease in the potential effectiveness of bombing operations than any other pilot defect is the inadequate knowledge of the engines and other mechanical equipment in the airplane. This deficiency causes pilots to turn back or abort after starting out on a mission either because of serious trouble due to improper handling of the engines or equipment, or because the pilot hasn't sufficient knowledge to evaluate a minor mechanical failure properly and turns back when he could have continued. It was stated that the engineering courses in phase training were especially weak, and that this was very serious for men who did not have the benefit of transition training.

The commanding officers reported that the new pilots were especially deficient in their knowledge of the operation of the planes' engines and

superchargers at high altitudes. It was stated that most of the new pilots were inclined to handle their planes and engines according to rules without understanding the basic principles involved. In combat operations the pilot frequently finds himself in a position where rules have to be violated if he is to complete his mission successfully, and it is very important that he know the basis for these rules. One pilot cited as an example of this the fact that he had been forced to ignore the technical rules for gas mixtures and keep his mixture leaned down as much as possible to get back to his base. Some other pilots on this flight who followed the rules were forced to ditch their planes in the channel because they ran out of gas.

The new pilots were also reported to be deficient in the broad knowledge of weather, navigation, and flying conditions which would enable them to make sound decisions and show that type of judgment known as air sense.

The other principal deficiency in pilot training was believed by these officers to be training in leadership. The importance of having a crew commander who is a real leader was discussed in an earlier section of this report. It was reported that many first pilots failed to take responsibility for the training and efficient functioning of their crews. Instead of developing a feeling of mutual confidence and pride in the crew as a basis for the type of teamwork necessary to success, they sometimes were victims of "first pilot-itus", the principal symptom of which is an inflation of the cranium. This disease is likely to lead to the feeling that other crew members are definitely inferior beings whose contributions to the success of the mission are negligible, but who are to be tolerated as menials who can be of occasional minor assistance. One cure for this

disease, although the treatment sometimes proved fatal, was a couple of rough missions. A better procedure was to move or suggest moving the first pilot to a position as copilot.

Navigation Training

The commanding officers reported they were pleased with the quality of men received in recent months as navigators. However, they indicated that these men had certain deficiencies in training which could not be completely eliminated by the short period of intensive training available overseas.

In regard to techniques the principal complaints were on insufficient training and experience on the simpler methods of navigation, namely, pilotage and dead reckoning. Some officers reported that new navigators had not had sufficient training in map reading and in some cases didn't know the conventional map symbols and signs. It was specifically recommended that the men be given more training in pin-pointing from high altitude especially through haze and partial cloud cover. It was also suggested that more practice should be given in navigation in formation and over water.

An important phase of navigation in the European theater which most of the men knew nothing about on arrival was the "Gee box" and other British aids to navigation. It was recommended that more training in radio navigation aids of the types used in the European theater be given both in navigation schools and in operational training. On the other hand, there is practically no use made of celestial navigation in combat operations in either the European or Mediterranean theaters.

It was stated that the navigators had not had sufficient training in

flexible gunnery.

The point mentioned most frequently by navigation officers in administrative positions was the desirability of having navigators who had complete confidence in their work and were trained to be not only ready but eager to take full responsibility for decisions on navigational matters. Such confidence can only be developed by a complete understanding of the equipment used including ability to inspect and maintain it, and well established habits of industry and systematic checking.

Bombardier Training

As mentioned in an earlier section the chief fault of bombardiers was their lack of ability to identify quickly and accurately the target on which they had been briefed. It was found that even those with very high aptitude for this type of work needed training and practice. The officers believed that "camera bombing" of briefed targets in training was one of the best methods for developing this highly important but definitely lacking skill. The training should include pin-pointing at frequent intervals after reaching the initial point, and should also include methods of estimating the position of the aiming point and synchronizing so as to hit it even when the point itself is completely obscured by partial cloud cover or a smoke screen.

In regard to the operation of the bombsight itself the principal criticism concerned the ability to make a very short bombing run and still hit the target. It was believed that bombardiers should be trained to make an accurate bombing run in 20 seconds or less. In combat operations smoke screens and haze frequently make it very difficult to identify the target from an oblique view so that by the time the view is sufficiently

vertical to see through the smoke or haze, not much time remains for the bombing run.

There were also complaints about bombardiers not having learned adequately, or at any rate having forgotten, how to obtain and preset the necessary data into the sight for high altitude bombing. It was reported that the bombardiers were especially likely to have forgotten about the use of the gyro, perhaps because they had never really understood it. Lack of a good comprehension of AFCE and skill in its use were also frequently mentioned.

The training of bombardiers in the operation of the new turrets was reported as usually lacking or deficient. Gunnery training in general in regard to theory, maintenance, and skill was stated to be deficient.

The general feeling of the commanders was that the bombardiers seemed to have been "kicked around" so much that they were indolent and could not be depended upon even to take the responsibility of getting their bombs away. In some groups attempts to get them to take responsibility for the guns and gunners on the crew had to be abandoned because they were so undependable. However, it was reported that the most recent replacements seemed to be better material and to be better trained than earlier groups.

The final point made by the combat officers was that the bombardiers coming into the theater should be informed concerning the special bombing techniques used in the theater, and given the type of fundamental training in tactical theory which would provide the basis for developing sound judgment as to when a short bombing run should be made and when they should make a very long run. Instances were reported in which bombardiers with absolutely no enemy opposition of any kind and a target which was easily

identified and clearly seen many miles away waited to start their bombing runs until only a minute or two remained, simply because they had been taught to make relatively short bombing runs.

Training in Gunnery and Enlisted Aircrew Specialties

The training of gunners is regarded by the officers in charge of operations in units in these theaters as most inadequate. They have had very little air-to-air firing. Some have reported they had absolutely none in the five months preceding their arrival in the theater. Those arriving in the theater some time after the development of the new methods of zone sighting still had no training in these procedures. Many of them had not had training in the use of the sight in general use in the European theater. It was recommended that one of the best methods of training would be for the gunners in bombing planes to use camera guns to aim at pursuit planes making simulated attacks of the most typical types.

It was stated that gunners were unable to install and maintain their guns when they arrived in the theater. One complaint was that the gunners did not clean their guns in operational training units. Another objection was that no training had been given in the special maintenance and preventive measures necessary to keep guns from freezing up at high altitudes. The Gunnery Officer in one heavy bombardment group reported that 90 percent of the gun stoppages in his group had been found to be due to lack of knowledge of their guns on the part of the gunners.

It was reported that some ball turret gunners arrived without any training in how to load the ball turrets. Turret operators were generally not adequately trained in the adjustment of the G-11 solenoids.

In the theaters they were attempting to make up for these deficiencies

in gunnery training by providing training in the groups themselves. This was not regarded as very satisfactory, however, since the individuals available for duty as Gunnery Officers usually lacked adequate training for the position. They were also handicapped by lack of good training weather, lack of sufficient planes for training, and lack of adequate training equipment.

Some deficiencies were reported with respect to radio operators. It was stated that some of them were slow at sending and receiving code when they arrived, and cases were reported in which it required three weeks' training to get men up to a proficiency level of 20 words per minute. Their ability to maintain their equipment was reported to be poor. It was stated that they had no knowledge of radio aids to navigation and also lacked knowledge of the proper tuning of the liaison transmitter over the complete range of frequencies.

The officers reported that the flight engineers were usually "rusty" on the maintenance of the plane when arriving in the theater because they had been kept off the flight line in operational training units.

In general the discipline and attitude of the enlisted members of the aircrew were reported to be bad on their arrival in the theater. Although this is doubtless due to a combination of reasons, it seems likely that the report that they spend most of their time while flying in operational training either loafing or sleeping would indicate that this phase of training did little to improve the situation.

Summary on Aircrew Training

The officers in charge of operations in these theaters report that the men who have been sent to them recently have been surprisingly good. With the tremendous expansion requiring the selection of a much larger group of men and the phenomenally rapid development of training facilities, it had been expected in the theaters that the quality of replacements would be low.

The commanding officers are very pleased to report that the new men appear to be better material and better trained than were those they replaced. This was considered to be especially true of pilots and navigators. The most recent bombardier replacements were reported to be showing an improvement in quality, and there is also some feeling that recent gunners show some improvement over their predecessors.

A long list of specific criticisms reported by officers in the theaters regarding the training of aircrew personnel has been compiled. In general these concern minor aspects of training though some of them are regarded by the personnel in the theaters as highly important. The chief complaints are in regard to the apparent slowness with which the lessons of combat are reflected in modifications in training procedures. The combat officers stated that most of the present deficiencies could be remedied by a relatively short period of training in which combat conditions and procedures were simulated with some exactness.

The fundamental training is considered to be good and the Squadron and Group Commanders are quite pleased with the major aspects of the training of most of the types of aircrew personnel. Of the sixteen hundred officers followed up in this study, there were only a small fraction of one percent

who it was believed were so lacking in ability that they should have been eliminated in training. This indicates that the selection and training standards have been very satisfactory. As a result of the recent increase in standards for selection and qualification for the various types of aircrew training and the reduction in training quotas, it is apparent that the officers in the theaters can look forward to a continued steady improvement of the quality of replacements for aircrew personnel.

Recommendation on Aircrew Training

It is recommended that operational training of aircrews include several training missions conducted under the supervision of recently returned combat personnel which simulate current combat conditions and procedures in the various theaters with a substantial degree of exactness.